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August 1978

U.S. Department of Agriculture

Meeting Clean Water Goals

From the Administrator

In 1972, the Federal Water Pollution Control Act Amendments challenged Americans to make our waters fishable and swimmable by 1983. To many, cleaning up the Nation's polluted rivers and lakes seemed an impossible task. It also seemed an incredibly broad challenge because pollution comes from so many different sources.

The American people, however, took up the challenge. They first attacked point pollution source by source.

Now attention is turning to nonpoint pollution, and conservation districts and SCS are in the vanguard of those trying to solve this problem.

Nonpoint pollution is diverse. In some places the worst pollutant is animal waste; in others, it is salty irrigation return flows. Nationwide the biggest pollutant, by volume, is sediment. In addition, sediment frequently carries other pollutants into our waters, such as fertilizers and pesticides.

Although the problem is complex, we have found that the best way to control pollution is by concentrating our effort in a rifle approach instead of a shotgun approach.

A small percentage of the land in many watersheds contributes most of the nonpoint pollution. Working with the U.S. Environmental Protection Agency and State 208 planning agencies, districts and SCS are helping to identify the areas that contribute the most pollution and are carefully designing and selecting practices tailored to take care of them first.

Best management practices (BMP's) include improved systems for controlling pollution originating from agricultural activities—better erosion control, integrated pest management, efficient irrigation, and safe disposal of animal waste.

The cost of installing BMP's would be a financial burden to some individuals, particularly farmers and ranchers. Recognizing this, Congress last year passed the Clean Water Act. The act calls for a Rural Clean Water Program that will provide financial and technical assistance to rural land users installing BMP's under long-term contracts.

The Rural Clean Water Program reinforces our rifle approach: cost sharing will be available only in authorized high-priority project areas. It strengthens district programs because BMP's to improve water quality often include the most needed soil conservation measures. And it greatly increases the Nation's chances of meeting our clean water goals.

Mel Davis

August 1978, Vol. 44, No. 1

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Soil Conservation

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by David G. Unger

Upgrading Water Quality

Abridged version of keynote address given by Mr. Unger at the 10th annual Waste Management Conference in Rochester, N.Y., April 26-28, 1978. The conference was sponsored by Cornell University, Ithaca, N.Y., and the U.S. Environmental Protection Agency.

The overall job of upgrading water quality will require an effective combination of good management, technical assistance, economic incentives, research, and education. It will need participation by individual land users as well as local, State, and Federal governments.

The U.S. Department of Agriculture (USDA) already has done a great deal to help improve the quality of our Nation's water and related resources. With new legislation—and new emphasis in our continuing programs—we will do even more.

Across the country, community after community faces difficult decisions about water resources. USDA tries to help through several programs:

- We give landowners and others a wealth of technical information, help them prepare conservation plans, and help them manage their resources and apply conservation practices.

- We compile new information through research programs and through soil surveys, vegetation studies, snow surveys, and other inventories.

- We participate in cooperative programs for protecting watersheds, preventing floods, controlling fire, conserving and developing natural resources, and managing forest lands.

- We serve as members of policy or advisory committees established by State and areawide water quality agencies and provide them with vital data.

- We manage National Forests, National Grasslands, and other units of the National Forest System, which make up some of the most important watershed areas in many parts of the Nation. We collect, analyze, and use a wide variety of resource data—much of it directly related to water quality.

- We provide information to landowners and the public about water quality problems and solutions.

Four new Federal laws will strengthen our role in water quality management:

1. The Surface Mining Control and Reclamation Act of 1977.

   Section 406 of this act establishes what we call the Rural Abandoned Mine Program. This is a voluntary program, designed to aid land users in reclaiming, conserving, and developing coal-mined lands that are either abandoned or inadequately reclaimed. Many of these lands are contributing to pollution problems. Cost sharing and technical help under the program are aimed at protecting people and the environment from the adverse effects of past coal mining, and promoting development of soil and water resources in unreclaimed areas. More than a million acres could be eligible for treatment in 377 counties in 29 States.

2. The Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA).

3. The Soil and Water Resources Conservation Act of 1977 (RCA).

   The RPA, administered by the Forest Service, and RCA, administered by the Soil Conservation Service, direct USDA to make periodic assessments of America's basic natural resources and to take actions that will protect and improve these resources.

The RPA, bolstered by the National Forest Management Act of 1976, seeks to help all Americans understand that the Nation's renewable resources are important, that long-term plans are needed for managing and using resources, and that citizens can participate in designing and evaluating the plans. Under the RPA, the Secretary of Agriculture prepares a periodic assessment of renewable resources of U.S. forest and rangeland under all ownerships; and a long-range recommended program for Forest Service activities in research, in management of National Forests and National Grasslands, and in aid to States and private forest landowners.

The RCA offers a better-than-ever chance to detect the really tough soil and water conservation problems, to develop new and more effective solutions to them, and to monitor how well the job is done.

Under RCA, USDA must:

- Make a continuing appraisal of America's natural resources.
- Develop a 5-year strategy, based on the appraisal, for dealing with soil and water conservation problems.
- Evaluate annually the progress of conservation programs in carrying out the 5-year strategy.

Through RPA and RCA, local people and State agencies will blend their own plans and ideas with national multiyear programs. The RCA also will make it easier to relate soil and water conservation to the natural resource functions that the RPA assigns to Forest Service.

The RCA could turn out to be the most significant soil and water law since the origins of our national program in the 1930's. Together, RPA and RCA provide us with an unparalleled opportunity to evaluate what we are doing and to make needed adjustments.

4. The Clean Water Act of 1977.

In his Environmental Message last year, President Carter pointed out the importance of State and local planning in controlling water pollution from farms and ranches, forest lands, mines, urban streets, and other sources.

The new Clean Water Act directs attention toward such high-priority areas where sediment, nutrients, pesticides, and other pollutants pose the greatest threat to streams, waterways, and lakes. These sources of nonpoint pollution will be identified in Section 208 plans prepared by local and State agencies and approved by the Environmental Protection Agency (EPA).

The Administration has requested funds to gear up for implementation of a new Rural Clean Water Program authorized by the act. The program calls for cost-share incentives to farmers and ranchers under long-term contracts to help finance best management practices for nonpoint pollution reduction.

USDA and EPA also have begun a Model Implementation Program (MIP) to demonstrate how a coordinated program of conservation systems can reduce nonpoint source water pollution. Our team has selected MIP project areas in seven States. The soil and water conservation work needed in these areas will begin within 6 months and most will be completed within 3 years.

USDA will continue to do everything it can to help upgrade water quality. The job will call for the best efforts of all of us.

Assistant Secretary of Agriculture M. Rupert Cutler has said that rural water quality management must be built on four principles:

1. A voluntary approach with farmers and ranchers that builds on existing working relationships to get the job done while preserving as much freedom of choice for private citizens as possible.
2. Economic incentives to landowners to reflect the benefits that accrue to society as a whole: economic growth, improved water quality, better wildlife habitat, esthetic values, and others.
3. Team efforts that will accomplish more than the sum of individual programs of universities, Federal and State agencies, farm groups, and conservation and environmental organizations.
4. Recognition of how many programs on land use—particularly on prime farmlands and timberlands—affect water quality.

I would like to add one more. We need more facts. Research and monitoring are critical. We are going to be spending a good deal of time and money on this problem and will be asking much from farmers, ranchers, and other landowners. We need to refine our information, gather new data on the effects of those practices selected to help achieve cleaner water, and constantly review and revise our practices and programs in accordance with what we learn.

We need to start where we are. But we need to start. And concurrently we need to learn more and as quickly as possible.

Mr. Unger is acting deputy assistant secretary for Conservation, Research, and Education, USDA, Washington, D.C.

Conservation Practices Help Meet Clean Water Goals

Background

The goal of the 1972 Federal Water Pollution Control Act Amendments (Public Law 92-500) is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. The legislation calls for achieving water quality that is suitable for fishing and swimming by 1983 wherever it is practical to do so. The question of whether it is practically, economically, or humanly possible to accomplish these goals within the time frame of the law looms in the minds of many people.

The national investment for cleaning up point sources of pollution has been enormous, and the Federal government and industry seem committed to continuing this investment. As progress is made in controlling municipal and industrial pollution, the problem of nonpoint source pollution becomes more apparent. A concerted effort must be made to control this pollution from diffuse sources if 1983 clean water goals are to be achieved.

by James S. Johnson

Adapted from a paper presented by Mr. Johnson at the 10th annual Waste Management Conference in Rochester, N.Y., April 26-28, 1978. The conference was sponsored by Cornell University, Ithaca, N.Y., and the U.S. Environmental Protection Agency.

Nonpoint source pollution comes from many varied and diffuse sources. It is basically influenced by land use activities along with climatic, hydrologic, soil, and geologic factors. Because of the relationship of activities on the land to nonpoint source pollution, land management practices will play a major role in the cleanup. Practices that are looked to for performing this role have become widely accepted as best management practices (BMP's).

The term "best management practices" originates with the Environmental Protection Agency (EPA) guidelines for continuing planning pursuant to Section 208 of the 1972 Federal Water Pollution Control Act Amendments. The definition of BMP's in these guidelines follows:

"The term 'Best Management Practices' (BMP) means a practice or combination of practices that is determined by a State (or designated areawide planning agency) after problem assessment, examination of alternative practices, and appropriate public participation to be the most effective, practicable (including technological, economic, and institutional considerations) means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals."

BMP's to control nonpoint source pollution are being incorporated into the water quality management plans being developed in accord with the requirements of Section 208. The plans address nonpoint source control needs, and identify and evaluate measures and practices that will produce a desired level of control. The practices that are selected are placed in the 208 plan as BMP's. The basic philosophy is to treat the sources of problems as they occur on the land.

Because of the variability in sources, climate, topography, and soils, the criteria for BMP selection must be tailored to meet the needs of the site and the nature of water quality problems. The goal of BMP's is to insure that activities on the land do not pollute the Nation's streams, lakes, and rivers. This approach is far less complex and is more fair to all landowners than for pollution control experts to study a stream and try to assess portions of responsibility. A treatment plant operator can adjust his operation to meet a given effluent standard. But it is somewhat unreasonable to tell a farmer plowing his fields or a logger harvesting his trees that his operation must never exceed a given effluent or downstream water quality standard.

Instead of trying to regulate agricultural and silvicultural activities with effluent standards, compliance can be based on using proper land management practices and monitoring or inspecting these activities. Research eventually should be able to provide us with the link between downstream water quality and upstream land activities, so that management practices that are consistent with downstream water quality goals can be defined.

Making our waters fishable and swimmable by 1983 is a big job. Conservation practices will help us meet the challenge.

Instead of trying to regulate agricultural and silvicultural activities with effluent standards, compliance can be based on using proper land management practices and monitoring or inspecting these activities.

Soil Conservation Movement

The soil conservation movement, spearheaded technically by the Soil Conservation Service (SCS) and operated locally by conservation districts, has tailormade resource management systems to fit virtually every acre of land in the United States. For more than 40 years districts have been concerned about land and water use within their boundaries, and they have developed programs to solve land and water resource problems.

Each field office of SCS is equipped with a technical guide that is specifically adapted to the local field office area. These guides provide information to help soil conservationists and land users consider alternatives and arrive at decisions on how land is to be used and treated to accomplish soil and water conservation objectives. The field office technical guide is the basic SCS document that provides quality standards for planning and applying soil and water conservation practices.

SCS is an action agency. Its soil conservationists are trained and experienced in providing onsite technical assistance to land users for planning and carrying out soil and water conservation programs. This person-to-person relationship is essential in achieving soil and water conservation objectives with our Nation's farmers and ranchers. Each agricultural operation is unique. A soil conservationist, equipped with his or her knowledge, experience, and the SCS technical guide, has a special ability to consider alternatives with farmers and ranchers and help them find acceptable solutions that will be carried out. This same approach is needed to plan and apply BMP's in rural areas.

Soil and Water Conservation Practices Corollary to BMP's

Many soil and water conservation practices and resource management systems are corollary to BMP's. They are among the practices that are being examined and assessed for

In conservation tillage, crop residues control the movement of fine soil particles and reduce soil lost in runoff.

Contour stripcropping which alternates strips of row crops with strips of sod crops is much more effective in controlling erosion and filtering sediment than contouring alone.

A person-to-person relationship with our Nation's farmers and ranchers is essential in achieving soil and water conservation objectives.

their effectiveness in improving water quality in 208 planning that is underway throughout the Nation. Land treatment to improve water quality is site specific. Because a single practice will seldom achieve all the desired effects, a combination of practices is usually selected to meet the needs of each land and water problem. SCS has called this combination of practices a resource management system. The practices and systems that 208 planners select for their contribution to improved water quality are BMP's.

BMP's may consist of a single conservation practice or may incorporate several resource management systems. They may also include practices that help control nonpoint source pollution but that have not been thought of traditionally as soil and water conservation practices. Road-salt management, street sweeping, and pet litter management practices are some examples of this latter category.

Conservation cropping systems that include sod crops in sequence with row crops are excellent soil and water management systems. The protective and filtering effects of sod and its residues reduce the loss of sediment and agricultural chemicals from the land. Contour stripcropping, which provides for sod strips alternating with cultivated strips, is twice as effective in controlling erosion as contouring alone.

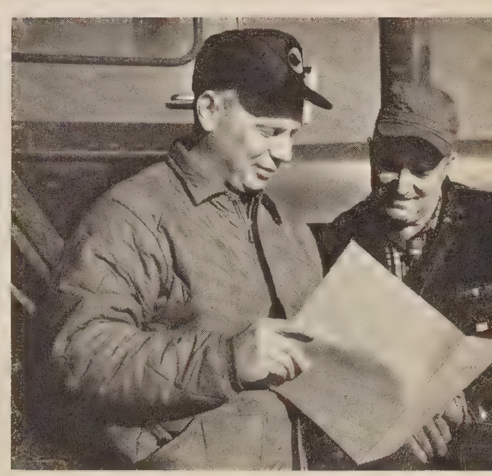
Grassed waterways are used extensively as outlets for terraces and diversion channels and for disposal of runoff from contoured rows and natural depressions. Well-sodded waterways also filter out sediment, thus further helping to improve water quality.

Terraces have been used from the time of early civilizations to control erosion where sloping land is intensively cultivated. They are effective in reducing runoff and the transport of eroded soil to stream channels and they contribute to moisture conservation. According to SCS records over 2 million kilometers of terraces have been installed nationally.

Where crop residues are adequate to provide nearly complete surface cover, no-till planting can be a very effective year-round erosion control method. This and similar conservation tillage practices have shown good results in controlling the movement of fine soil particles. There are certain problems with no-till methods that need considerable attention for resolution. They usually require more herbicides and insecticides than conventional systems. Also, nitrogen and possibly phosphorus can be leached from residues left on the surface. But the increased hazard of pollution from these soluble nutrients is usually offset by the much greater reduction in soil losses and runoff. This will become increasingly true as less persistent pesticides are used, integrated pest management practices are adopted, and fertilization timing and management practices are improved.

At left, grassed waterways filter sediment and other pollutants from runoff and safely carry excess water off fields without gullying.

At right, SCS personnel help farmers and ranchers plan conservation practices as part of resource management systems.



Concerns for Effectiveness

There are some unanswered questions about the total effectiveness of soil and water conservation practices in improving water quality. As water quality becomes more significant, the dynamics of the effects of applying a practice become more complex. More research is needed to improve our ability to design and apply practices and to predict with greater certainty their total effect on water quality. Problems vary considerably from site to site, and reliable research efforts are vast and expensive. Error analyses for a broad study of loading functions indicate that the margin of error could run as high as 50 percent.

Still, it is logical to use soil and water conservation practices and resource management systems to improve and maintain water quality. It is widely accepted that sediment, in terms of volume, is the greatest pollutant in our surface waters. Sediment pollution muddies the water, inhibits photosynthesis, clogs fish gills, and increases oxygen demand. Also, removing sediment from public water supplies is costly. Soil and water conservation practices have a proven ability to reduce sediment pollution by controlling soil erosion. The amount of sediment reduction that takes place as erosion is reduced depends on the sediment delivery ratio.

A good example of water quality improvement through soil and water conservation practices is the reduction of sediment rates in Georgia's Jackson Lake. In 1939, the lake's sedimentation rate was 107 acre-feet per year. By 1967 the rate had dropped to 29 acre-feet per year, and when a planned watershed project is completed, the rate should drop to 10 acre-feet per year.

Conservation practices have also helped to reduce the turbidity of intake waters at the Atlanta, Ga., waterworks on the Chattahoochee River. In the early 1930's, total suspended solids averaged 400 parts per million (ppm). As conservation practices were installed in the watershed, this declined steadily to less than 25 ppm.

These two examples illustrate the beneficial effect of using a diversified soil-conserving system of grass, livestock, trees, and row crops in conservation rotations supplemented by a complete water management system. They exemplify a change from land misuse to wise use and its beneficial effects on water quality.

Sediment is one of the significant transport mechanisms for nutrient and pesticide pollutants. More than half of the kinds of pesticides that are used on corn, cotton, and soybean rowcrops are transported by sediment. Paraquat, one of the more persistent pesticides used with no-till planting techniques, is transported on sediment. Sediment carries most of the phosphorus and organic nitrogen that get into water. The kind of soil substantially influences pesticide and nutrient transport by sediment. More research is needed on the properties of individual soils, how

Sediment kills plant and animal life in our Nation's surface waters, and carries nutrient and pesticide pollutants.

Instead of widespread general treatment, the greatest beneficial effect on water quality is likely to be accomplished by carefully designing treatment to take care of the "hot spots" first.

well erosion control practices control the movement of fine particles, and transport mechanisms. Until this information is available, it will be difficult to predict precisely the beneficial water quality effects of erosion control practices. The available research and information provide reasonable assurance that practices that control erosion and sediment delivery also have some effect on the reduction of pesticide and nutrient pollution. Practice design should take into account that controlling the movement of fine particles is most important because these particles have a much greater capacity than coarse particles for transporting adsorbed pollutants.

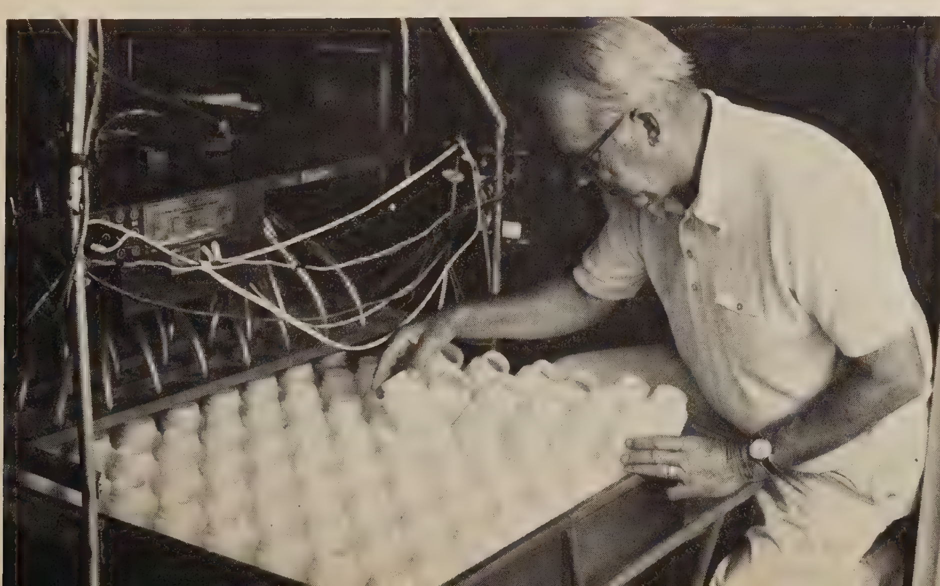
Much of the eutrophication of our lakes by nutrient enrichment is the result of increased levels of phosphorus from domestic and industrial wastes and from land runoff. In the Great Lakes, it has been estimated that diffuse sources of phosphorus may account for about 50 percent of the total tributary loading. Phosphorus entering the lakes from diffuse sources is primarily sediment associated. Practices that reduce the sediment load will, therefore, contribute to reduced phosphate loadings.

The seriousness of nonpoint problems must be carefully assessed in 208 planning and the "hot spots" clearly identified. Instead of widespread general treatment, the greatest beneficial effect on water quality is likely to be accomplished by carefully designing treatment to take care of the hot spots first. A study in a 700-hectare cultivated drainage area in the Black Creek watershed in Indiana has shown that a 40-percent reduction in stream sediment could be achieved by concentrating treatment on only 30 hectares. A study in the Great Lakes Basin by the International Joint Commission's Pollution from Land Use Activities Reference Group indicates that 60 percent of the agricultural sediment load may be generated in 30 percent of the agricultural area of the basin. This study stresses the need for concentrating on remedial measures in "hydrologically active zones."

Developing Areas

SCS expertise has been drawn on to an increasing extent for control of runoff and erosion in urbanizing areas. SCS technical guides have been expanded to include soil and water conservation practices that meet the needs of these developing areas. Guides and handbooks for erosion and sediment control in developing areas are also available from many conservation district offices.

The sediment load from construction sites and developing areas comes from only a small part of our total land area. Sediment problems can be very critical, however, in those areas where development and construction activities are concentrated. The polluting effect of large volumes of sediment has been readily recognized in developing areas. It is not unusual for construc-



In the Black Creek study, automatic sampling machines are used in testing the amount of sediment in streams during usual flow and during times of increased runoff. Increased stream flows trigger the machine to take samples every 20 minutes.

It is not unusual for construction sites to produce 10 to 20 times more sediment per unit area than agriculture.

tion sites to produce 10 to 20 times more sediment per unit area than agriculture. Conservation districts have actively participated with State and local governments in programs to control erosion and sediment in developing areas. The National Association of Conservation Districts has provided leadership for strengthening these programs through a Model State Act for Erosion and Sediment Control.

The timely application of practices to control erosion and reduce sediment delivery from developing areas is especially important. Because excessively high rates of erosion usually do not continue very long after construction is completed, action must be immediate to be effective.

Vegetation is the first line of defense against erosion and is especially useful in developing areas. Site planning to maintain as much of the natural vegetation as possible has proved effective. Proper timing of construction operations and temporary seedings are also good management practices for construction sites. Permanent vegetation should be established as soon as conditions permit. Mulches are valuable for controlling erosion, conserving moisture, and providing stability until new plantings are established.

Structural practices, such as land grading, diversions, streambank stabilization, and grade stabilization structures, can be used where vegetative measures are not adequate for erosion control. Debris or sediment retention practices can be installed to reduce the amount of sediment delivered from construction sites. These may consist of vegetative filter strips and various structures and filters that hold water long enough for sediment to settle out.

Properly designed stormwater management programs and practices also contribute to the control of nonpoint pollution from developed and developing areas.

Debris basins at construction sites collect runoff and allow sediment to filter out of the water, helping to prevent heavy sedimentation downstream.

Vegetation established as soon as possible after construction is the best protection against erosion and sedimentation.

Agricultural Waste Management

Agricultural waste management systems for safely handling manure and other agricultural wastes will play an essential role as BMP's in many areas. The SCS technical guides and the waste management handbook are readily available tools for planning and installing these systems.

Waste management practices should be designed and applied to meet site-specific needs. In northern climates, for example, successful land application must rely more on the absorptive capacity of the soils and less on microbes and plant roots. Time of application is important to prevent loss of nitrogen.

A study in New York State indicates that control of barnyard runoff could provide the greatest reduction in dissolved phosphorus loadings entering Cayuga Lake. This same study also indicates that, next to sewage treatment, controlling barnyard runoff is the least costly means of reducing the dissolved phosphorus loading in central New York State.

Pastures that are well located and properly managed are not usually the source of serious nonpoint pollution problems. These pastures should be large enough and grazing distributed to keep wastes from becoming concentrated. Fencing to limit the access of livestock to streambanks will reduce aggravated streambank erosion and control the amount of defecation going directly into the stream. Fertility and pesticide management practices that provide for the proper type, timing, and rate of application are also important aspects of pasture management systems for water quality.

The hazard of runoff pollution increases when animals are crowded into lots devoid of vegetation. Practices that control runoff from manure accumulations and livestock feeding areas and the incorporation of manure into the soil immediately after spreading have proved effective. Storage facilities must be designed with adequate capacity to store drainage from silos, wash

Well-designed waste management systems for livestock feedlots prevent liquid and solid waste from entering streams, rivers, and lakes.

To avoid placing an insurmountable economic burden on American agriculture, Congress has decided that a cost-sharing program is needed to help fund the installation of practices for controlling nonpoint source pollution in rural areas.

water, and other wastes from the livestock operation for the time when spreading on land endangers water quality. Practices such as diversions that direct clean water around the site can help reduce the storage capacity that is needed.

Irrigated Agriculture
Irrigation has made possible some of the most productive agricultural regions in the United States. Irrigation water management systems need careful design that is based on a complete understanding of the regional hydrology. Salinity and nutrient pollution from irrigated land are two of the major problems threatening water quality.

Proper timing and the rate of irrigation water application are important for both efficiency and water quality. Runoff recovery systems can reduce polluted runoff and raise existing 50 percent efficiency ratings to 85 percent. Specific causes and relationships need to be identified to determine with greater certainty the beneficial effects of irrigation water management systems.

Cost Sharing to Apply Practices
Meeting water quality goals is going to be costly. SCS has estimated that it will cost $7 billion from now to the year 2000 to treat 20 percent of the most critical areas to improve water quality. The bulk of this expenditure falls on the owners and operators of our Nation's farms and ranches, and most of the benefits will be offsite. The nature of farm commodity pricing makes it very difficult, if not impossible, for farmers and ranchers to recover such expenditures. To avoid placing an insurmountable economic burden on American agriculture, Congress has decided that a cost-sharing program is needed to help fund the installation of practices for controlling nonpoint source pollution in rural areas.

Section 35 of the Clean Water Act of 1977 (Public Law 95-217) authorizes this kind of program. This new legislation calls for USDA to administer a Rural Clean Water Program (RCWP). This program will provide technical assistance and cost sharing for measures and practices to improve water quality. It will apply only to areas that are identified in 208 planning as high priority.

Technical and financial assistance will be provided to land owners and operators to help them install measures and practices to improve water quality in areas that are identified as critical in 208 plans. Cost sharing will be provided only on the basis of long-term contracts of 5 to 10 years duration. Wherever practicable, agreements will be signed to provide grants to conservation districts, State water quality agencies, and State soil conservation agencies to administer all or any part of the program locally.

The RCWP is being developed with assistance from local, State, and other Federal agencies including EPA, which must concur in the program. There is a national coordinating committee of the administrators

Installing diversion terraces helps divert runoff toward suitable outlets such as grassed waterways. Rural Clean Water Program funds will be available to farmers and ranchers for installing conservation practices to improve water quality in high priority areas.

of certain USDA agencies and EPA. State coordinating committees are to have members from USDA, State soil conservation agencies, conservation districts, and State water quality agencies.

Summary

The soil conservation movement, operated at the local level by conservation districts, has a significant role to play in efforts to control water pollution from nonpoint sources. Sediment is the greatest pollutant, by volume, of our Nation's streams, lakes, and rivers. Eroded soil particles, especially fine clay particles, serve to transport nutrients and pesticides that can further damage water quality. Conservation districts with SCS technical assistance have more than 40 years of experience in controlling soil erosion. The benefits of conservation practices and resource management systems are being examined in water quality management planning, and those practices and systems that are deemed effective are being selected by water quality management agencies as BMP's or components of BMP's.

Planning and application of site-specific practices are essential. SCS conservationists are experienced and equipped with the knowledge and technical guides to perform and train others to perform this task. The best approach is to concentrate on the critical areas or "hot spots" that are sources of nonpoint pollution. Soils, geology, hydrology, and climate along with land use activities are among the major items to consider in locating the hot spots and in designing the control practices.

Using conservation practices with the specific emphasis on water quality improvement is a new approach. Additional research and monitoring are needed to improve practice design and application techniques for this purpose and to predict with greater certainty the total effect on water quality.

Because the expense of installing BMP's will be great and most of the benefits will be offsite, a cost-sharing program is needed to make the installation economically feasible, especially in rural areas. Section 35 of the Clean Water Act of 1977 is intended to serve this need.

Mr. Johnson is a soil conservationist, Resource Development Division, SCS, Washington, D.C.

What is 208?

by Frank Jeter

Section 208 of the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500) deals with point and nonpoint sources of water pollution. Last fall, North Carolina held a series of eight public meetings throughout the State to tell people about "208 planning."

The meetings stressed the role of agriculture in controlling nonpoint pollution. The Agricultural 208 Task Force, chaired by the North Carolina Soil and Water Conservation Commission, sponsored the meetings. Other members of the task force included the North Carolina Department of Agriculture, the North Carolina Agricultural Extension Service, the U.S. Department of Agriculture's Soil Conservation Service, the Farm Bureau, and the North Carolina Grange.

Following presentations by State and Federal agencies involved in 208 planning, the meetings were opened to questions and discussion. Some questions people asked were: "How will 208 affect me? How can this program make everyone cooperate? Will the 208 laws be enforced?"

The most frequently asked question was: "How much will it cost and how will it be paid for?"

Mr. Jeter is public information officer, SCS, Raleigh, N.C.

Erosion It's Not Just a Farm Problem

by Emmett J. Egr

A demonstration project shows how erosion can be controlled and sediment reduced on the site of an urban housing development.

Soil erosion and sedimentation are often thought of as strictly farm problems. But stripping the land of topsoil and vegetation during residential, industrial, and commercial development also leaves the soil bare and vulnerable to erosion. Damage caused by erosion to homesites and streets is a costly problem for landowners, and the sediment from erosion clogs and pollutes streams, rivers, and lakes.

People in the Omaha, Nebr., metropolitan area are trying to solve the erosion problems that accompany urban development. The Papio Natural Resources District (NRD) is working with the city, the county, and the Soil Conservation Service to help developers work out guidelines for controlling erosion and sedimentation at construction sites. The Papio NRD is a subdivision of the State government and covers three counties and the city of Omaha.

In fall 1977, the district began working with Creative Land Consultants, a developer, to set up a demonstration project. Gary Morgan, Papio NRD natural resources planner, and the SCS district conservationist worked with the developer on an erosion and sediment control plan for a 45-acre housing development in Omaha. Papio NRD is providing 75 percent of the erosion and sediment control project costs.

Plans include a variety of sediment and erosion control measures. Dikes were installed to divert stormwater runoff away from steep slopes, streets, storm sewers, and adjacent agricultural land. The runoff collects in several temporary sediment basins that have been installed around the construction site.

A sediment trap with a rock filter was built in one area of the construction site where there was not enough space to build an adequately sized basin. The rock filter provides secondary treatment for sediment not contained by the trap.

Bales of straw were placed as sediment barriers in drainageways and on other critical slopes to retard and filter runoff. Critical slopes were also protected with straw mulch.

To keep mud from construction vehicles off paved streets, entrances to the site were stabilized with rock 8 inches deep. The rock removes mud from vehicle tires.

After grading was completed, the topsoil was replaced and seeded. The establishment of an effective vegetative cover, such as grass or alfalfa, will phase out the need for building permanent structures to control erosion and sediment.

The first real test of the demonstration project came when moderate to heavy rains fell during and immediately after grading. Sediment and erosion were adequately controlled.

"We want to show land developers and the public that there are economical methods for controlling soil erosion," explained Grey Pearson, project coordinator for Creative Land Consultants. "We'd also like to have a role in improving the quality of life in Omaha."

The demonstration project is providing an opportunity for the Papio NRD and SCS to evaluate the effectiveness of erosion and sediment control measures and to determine if any of the measures inhibit land development. The project may also supply data for State and local studies of nonpoint source water pollution under Public Law 92-500.

Construction work goes on next to a temporary sediment basin which the developer installed to collect runoff.

Mr. Egr is director of information and education, Papio Natural Resources District, Omaha, Nebr.

Grass in the Orchards, It's Not All Bad

by Pierce A. Drummond

It was against tradition, but peach growers in South Carolina discovered there were benefits to letting grass grow between orchard rows.

Fifty years ago, when commercial peach production started in Spartanburg County, S.C., the rule was to keep the ground clean. A farmer who let weeds or grass grow in his orchard was considered a slouch.

But clean cultivation was time consuming and expensive. It caused some other problems, too. After a rain, spray machines cut deep ruts into the soft, clayey soil, and it wasn't unusual to see two tractors hooked together pulling trailers full of peaches out of the orchard at harvesttime. Soil losses were terrific, and the hills that weren't in peaches were in clean-tilled cotton and corn, compounding the erosion problem.

The Soil Conservation Service recommended using permanent sod strips of tall fescue between the rows of trees to control erosion and make it easier to get machinery in and out of the orchards. In the 1960's, producers began using sod strips and discovered that peaches could be grown using the strips between each row equally as well as in clean-tilled orchards.

Olin Blackwell of Inman, S.C., is one of the growers who changed from clean cultivation to using sod strips in his 250-acre orchard. "It just doesn't make sense to disk an orchard several times a year, when you can use the grass to keep equipment out of the mud and cut down on erosion," Blackwell said. "After I get a 14-foot strip of tall fescue established between each row, I work around the trees with a mechanical hoe. On the older orchards I use a herbicide along with occasional hoeing to control weeds around the trees. The only implements I use for cultivation are a rotary mower, a mechanical hoe, and a herbicide sprayer."

Sod strips between rows of trees keep machinery from sinking into soft soil.

Spartanburg County has about 24,000 acres of peaches which rank it among the top peach counties in the Nation. Blackwell estimates that 90 percent of the growers in the county currently use permanent sod in their orchards.

"If you don't spray sulfur to control brown rot during a rainy season, you don't have marketable peaches at harvest," Blackwell said. "The sod strips will hold up spray equipment even when the ground is wet. But you have to fertilize the grass to get it established and to maintain a heavy sod. Heavy sod is essential to withstand traffic and control runoff."

The green, mowed strips between the rows of trees give Blackwell's orchards a landscaped appearance. His older orchards are contoured and the rows are planted on small beds so each row acts as a miniature terrace. He and some of the other growers in the county are trying straight rows in new plantings. "On gently sloping land straight rows with a good sod will work," said Blackwell. "But you'd better stay with contoured rows on steep land."

Mr. Drummond is district conservationist, SCS, Spartanburg, S.C.

Cheatgrass Gets Caught with Conservation

by Fred Trump

Three Kansas wheat farmers use conservation methods such as crop rotation and minimum tillage to control cheatgrass.

One of the toughest problems for Kansas wheat farmers who try to grow continuous wheat occurs during unusually wet and unusually dry seasons. That problem is cheatgrass. Also known as downy brome, this weed pest competes heavily with the wheat crop.

However, there are several ways of controlling cheatgrass other than the too common practices of excessive tillage and burning of stubble, according to Earl J. Bondy, Soil Conservation Service conservation agronomist at Salina. The cheatgrass problem in Kansas, he pointed out, is not unlike the weed problems that occur in continuous cropping in other parts of the country.

"More tillage of wheat ground than is necessary only wastes time and precious fuel, and exposes the soil to wind and water erosion—without doing anything to control cheatgrass," he said.

"Burning stubble destroys valuable organic matter needed to maintain good soil tilth. But it has little or no effect upon cheatgrass seed, which has already shattered and fallen to the ground. Many farmers have found that burning stubble makes their soil 'hard as concrete.'

"The best way to control cheatgrass is a crop rotation that breaks up the sequence of continuous wheat," Bondy advised. "Just as johnsongrass and shattercane in sorghum are controlled by bringing wheat into the rotation, so can cheatgrass in wheat be knocked out by alternating wheat with sorghum."

Larry Sneed of Kiowa County is a concerned conservation farmer who

V-blade sweeps that operate horizontal to and just below the soil surface are effective in Kansas as a tillage tool to control weeds in wheat stubble. Most of the stubble remains on the soil surface to protect the soil against wind and water erosion.

maintains wind stripcropping and terraces where needed and does as little tillage as possible. Even when cheatgrass has become a problem in the past 3 years, he has gone to a variety of techniques that are not in conflict with good conservation farming.

On sandyland he follows a rotation of wheat, grain sorghum, and fallow to control cheatgrass. A further benefit for him has been considerably higher yields of both crops.

After wheat harvest in June on sandyland, the stubble is not touched until the following April. Then the stubble and weed growth are "bladed" once or twice with sweeps. The field is then disked with an offset disk in mid-May prior to grain sorghum planting about June 1. Sneed pulls a packer behind the disk, a practice he uses to control wind erosion on this type of soil.

The grain sorghum is cultivated three times—once with a horizontal knife, once with a spiketooth harrow, and once with a disk cultivator or rolling-type cultivator.

After the sorghum is harvested in late September, the field lies fallow until mid-September of the following year. The only tillage he does is during the summer—blading the field with the offset disk and packer.

Sneed finds that his well-timed "minimum of tillage" controls weeds without the expense of herbicides. He feels that the effects of herbicides are not very predictable, particularly on sandyland.

On hardland he has used both a wheat-fallow rotation and continuous wheat. Tillage with sweeps in the wheat-fallow rotation on much the same schedule as on sandyland keeps cheatgrass under control. When cheatgrass and thistles

threatened his continuous wheat production in 1977, he disked the weeds and stubble under in the spring and planted the field to grain sorghum. The temporary wheat-sorghum rotation solved the weed problem.

The heart of weed control on the 280-acre farm of Roy Anderson, Clay County, is contained in the two words "crop rotation." When cheatgrass is not a problem on a particular field, he has a crop rotation of 2 years of wheat and 1 or 2 years of grain sorghum.

On 40 acres, however, he used a 2-year, wheat-grain sorghum rotation to control cheatgrass. He plants wheat around the first week in October—at the time of the Hessian fly-free date. This is not so much because of this insect as to give cheatgrass and volunteer wheat a chance to be killed by a one-time tillage after sorghum with sweeps early in September. In a wet September he has to go over the field twice with sweeps.

"Some farmers," Anderson said, "are so concerned about planting wheat early enough so there will be some growth before the winter dry season that they overlook the need to control cheatgrass just before planting. Burning stubble doesn't help control cheatgrass a bit. That only burns up $10 to $15 worth of nutrients per acre."

When grain sorghum follows wheat, Anderson follows the same September tillage program, with no tillage between wheat harvest and September.

"I don't need to work the wheat stubble before then," he said. The following spring in mid-May he sprays for bindweed, then disks the ground, and plants grain sorghum.

"Rotation and minimum tillage have done the job for me in controlling cheatgrass," the Clay County farmer added. "I haven't needed a herbicide to control cheatgrass."

But for general weed control on fields going into sorghum, Anderson uses a herbicide. He applies one pound of atrazine per acre in bands over the rows at planting time. Cheatgrass is not a problem during planting if it has been controlled earlier by timely minimum tillage.

Similar weed control—and tractor fuel savings—are accomplished on another 75 acres in a 3-year rotation of wheat, sorghum, and oats. The rotation from sorghum to spring-seeded oats is easier than going from sorghum to wheat, according to Anderson.

A herbicide, such as atrazine, can be applied for cheatgrass control after wheat harvest if sorghum is to be planted the following spring, said Bondy. If sorghum is planted in wheat stubble immediately after wheat harvest, any of several other herbicides control cheatgrass.

Atrazine can also be used in a wheat-fallow rotation, provided it is applied about a year before planting wheat. Farmers, of course, should read the label before each use of a herbicide, and apply only as directed, in amounts and at times specified.

Willis Brandyberry, a Graham County Conservation District supervisor, is convinced that the herbicide atrazine pays in his wheat-grain sorghum-fallow rotation. He undercuts the stubble and weeds and applies anhydrous ammonia right after wheat harvest. Atrazine applied to wheat stubble in midsummer effectively controls cheatgrass, redroot, pigweed, and fireweed (Kochia) through the sorghum crop the following year. If the summer is especially dry, the herbicide will control Russian thistle and sandbur, too. Only if the spring is wet does Brandyberry use sweeps in the stubble before planting sorghum. Otherwise, no spring tillage is used.

On his native grassland, Brandyberry has installed a planned grazing system. He expects this will rejuvenate the native grasses and crowd out the cheatgrass that is a source of infestation for his cropland.

Cheatgrass often grows in abundance along roadsides, in road ditches, on overgrazed rangeland, and in wasteland areas. Bondy advises herbicide treatment or mowing before the grass goes to seed. Uncontrolled cheatgrass in such areas is a massive source of cheatgrass seed infesting wheatfields. Rotational grazing of native grassland is effective in controlling cheatgrass, too, he advised.

It is also important, he added, to plant clean wheat and grass seed. Cheatgrass seed is often found in small grain and grass seed.

Mr. Trump is public information officer, SCS, Salina, Kans.

Help to Make It Through the Drought

by F. Dwain Phillips

Through the Great Plains Conservation Program, a rancher in Oklahoma was able to beat the odds—little available water, rough terrain, and erosion.

For Wesley Matteson, a rancher in Woodward County, Okla., developing a reliable source of water for his livestock operation was a real challenge.

Matteson operates 10,080 acres northeast of Woodward and has 550 head of cattle. He was plagued by uneven grazing distribution and erosion, especially in dry years, due to an inadequate water supply.

Bedrock is so close to the surface in his area it is difficult to dig ponds, and the ponds that are installed either leak or go dry in summer because of the low rainfall and inadequate watersheds. Matteson tried digging wells, but water was hard to find and it usually had a high mineral content, making it unsuitable as drinking water for livestock.

His worst erosion problem was on a 2,600-acre pasture of native grass where a few shallow ponds and a natural spring were the only sources of water for livestock. Areas around the ponds and spring were overgrazed and severely eroded while other areas of the pasture were not grazed at all. The rough terrain in the pasture made it impossible to use crossfencing to improve the grazing distribution.

Through the Great Plains Conservation Program (GPCP), the Soil Conservation Service helped Matteson solve the problem. SCS provided him cost sharing and technical assistance in the installation of more than 11 miles of plastic water lines and nine metal livestock watering tanks.

Matteson rented a ditch-digging machine, and, with help from family members, dug a 3-foot-deep trench and laid more than 58,000 feet of pipe. The pipe was hooked to a rural water line, and the tanks were arranged in the pasture to distribute grazing evenly and reduce erosion. Up to 3,000 gallons of water is pumped to the tanks daily.

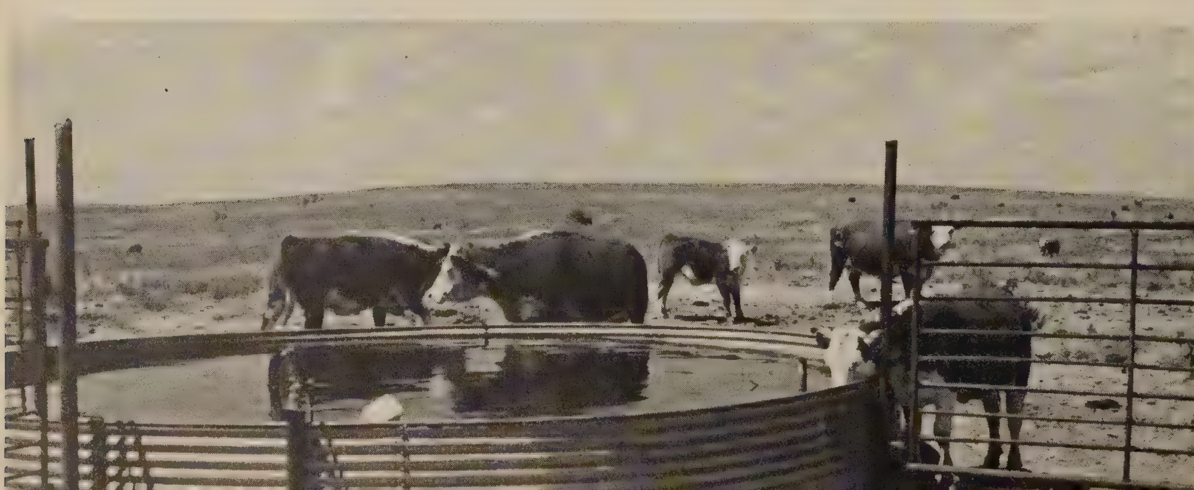
More even distribution of grazing has resulted in healthier plants that maintain uniform growth even through drought years. Matteson has established a year-round stocking rate of one cow to 20 acres and can still maintain adequate grass cover.

In 1975, for his work in protecting and improving the land, the Woodward County Conservation District named Matteson as their outstanding district cooperator. He also received special recognition for meeting the schedule in his conservation plan.

In addition to his livestock operation, Matteson grows wheat and sudangrass hybrids on 755 acres of cropland. He has built 41,000 feet of terraces on the cropland and has 15,000 more feet of terraces planned as part of his GPCP contract. Contour farming, managing surface residue, and planting 12 acres of bermudagrass to stabilize streambanks are other practices included in the plan.

Matteson's GPCP contract was developed for 5 years, and it is scheduled to be completed this year. Under the contract, he has been able to provide his livestock with an adequate and dependable supply of water, to achieve even grazing, to reduce erosion, and to improve his cropland.

Mr. Phillips is public information officer, SCS, Stillwater, Okla.



One of nine metal stockwater tanks helps an Oklahoma rancher distribute his cattle herd for even grazing.

Grazing Through All Kinds of Weather

by T. B. Trew
and Helen S. Jeter

Year-round planned grazing systems are helping Virginia cattlemen during good weather and drought.

Virginia is rich in natural resources. But the need for wise use and good management of these resources became especially apparent during the extremely dry summers of 1976 and 1977. Many Virginia cattlemen were forced to buy high-priced hay to feed their livestock or to sell their cattle on a depressed market.

Cattlemen who had year-round planned grazing systems for their pastures fared much better. They didn't have to winter feed until February 1977, or later, and they didn't have to feed at all in summer. In addition, they saved $40 to $50 on the annual cost of keeping a cow.

In Virginia, Soil Conservation Service personnel are working through soil conservation districts to help farmers put their pastures into year-round planned grazing systems. Each system is designed to meet a farmer's needs and to suit his soils, plants, and livestock operation. Grasses and legumes are fertilized or managed to provide grazing for cattle.

Nelson Diehl of Rockingham County has the oldest known planned year-round grazing system in the State. Diehl uses Kentucky 31 fescue and bluegrass-white clover mixture in his system. He fertilizes the fescue each August with 60 pounds of nitrogen per acre. Growth is allowed to accumulate or stockpile until November. Cows graze the fescue during the winter and again in early summer. Bluegrass furnishes spring and fall grazing. Based on soil tests, lime, phosphate, and potash are applied on all the pastures. Hay made from the fescue is stored and fed to the livestock only when snow covers the grass.

Diehl claims that he would not be able to keep cows without a planned grazing system, especially in dry years like 1976 and 1977.

Another Virginia cattleman, W. T. Barnes of Blackstone, said, "My planned grazing system has served me well for several years. It has meant more to me during the dry years than ever before."

According to William Wampler of Harrisonburg, his planned grazing system has enabled him to increase his stocking rate.

There are many advantages to year-round planned grazing systems. Cattlemen enjoy about an 80-percent reduction in hay, labor, and machinery needs. Cattle are healthier because they are out grazing most of the year. Most cattlemen also report increased weaning and stocking rates. Grasses and legumes are more productive and less affected by droughts.

Until recently, winter grazing has been a missing link in Virginia grazing systems. Now, Kentucky 31 fescue makes year-round grazing possible. It is fertilized in August and stockpiled for winter grazing. Orchardgrass, bluegrass, native grasses, and legumes are managed or fertilized to produce grazing when needed by the livestock at other times of the year.

Rotation grazing also is a part of the planned grazing systems. It avoids overgrazing and helps keep plants healthy and strong. Properly grazed pastures have quicker regrowth following rains than those that have been overgrazed.

The future looks brighter for Virginia cattlemen. About 15 percent of them are now using planned grazing systems or are in the process of establishing them. Year-round planned grazing systems are giving the State's livestock industry a much-needed economic boost—even during droughts.

Mr. Trew was an agronomist, SCS, Richmond, Va., and is now retired.
Ms. Jeter is public information officer, SCS, Richmond, Va.

A. G. Updyke is one of many Virginia farmers who graze their cattle year round. Cattle are fed hay only when the grass is completely covered by snow.

'Garrison' Creeps into South Dakota

by F. Dee Watson

'Garrison' creeping foxtail is a grass that is helping farmers in South Dakota and other Northern States make good use of poorly drained cropland.

Farmers in Brookings County, S. Dak., have converted many acres of low, poorly drained cropland into productive pastures and haylands by planting 'Garrison' creeping foxtail, *Alopecurus arundinaceus.*

"In 6 out of 10 years I couldn't get a crop on some fields because they were too wet," said Herb Vaske, who farms near Aurora, S. Dak. "I decided to put the fields into grass for my cattle." The grass Vaske selected was Garrison creeping foxtail. Using the Brookings Conservation District's grass drill, he planted the grass in late August 1973, and the next year he harvested the field for hay.

"During drought years, grazing the low areas planted in Garrison was the only thing that saved me and my farm," said Harold Evenson, who farms near Sinai, S. Dak.

Creeping foxtail is a grass native to Europe and Asia. It was brought to McLean County, N. Dak., by an immigrant homesteader. In 1950, a Soil Conservation Service plant materials specialist collected seed from fields of creeping foxtail near Max, N. Dak. The seed was increased at the Bismarck, N. Dak., Plant Materials Center (PMC). After years of selection and field testing the named variety, Garrison creeping foxtail, was released by the Wyoming Agricultural Experiment Station in cooperation with the PMC.

The first seeding of Garrison creeping foxtail in South Dakota was on the Allan Watt farm near White. A 12-acre field was planted for seed production using certified seed from the PMC. Watt and his son, Greg, now have 50 acres seeded to Garrison creeping foxtail which they use for pasture and hay or for producing seed. SCS provided technical assistance in the original planting and harvesting of Garrison on the Watt farm.

Only wet ground should be seeded in Garrison. Seeding can be done in April or May if it's not too wet to get onto the land, or in the first part of September. Watt prepares the seedbed by disking twice and packing it thoroughly. He uses a two-wheeled fertilizer spreader with an agitator and plants about 5 to 6 pounds of seed per acre. After planting, Watt harrows the field once to barely cover the seed.

It takes about 3 years to get well-established sod. Not grazing it the first season allows the plants to fully develop. In some places, established Garrison sod has been under about 2 feet of water for almost 3 weeks without drowning out.

Watt uses 90 to 120 pounds of actual nitrogen per acre for good yields. South Dakota State University ran a fertility test on his land in 1969. Test results showed that applying 60 pounds of nitrogen increased the hay yield from 690 pounds to 1,940 pounds per acre. Applying 120 pounds of nitrogen increased the yield to 3,590 pounds of hay per acre.

According to Watt, Garrison creeping foxtail is not a heavy seed producer. He gets about 100 pounds of seed per acre. Watt says the best time to harvest the seed is the end of June and beginning of July.

He windrows the grass, cutting just below the leaf tops so that the heads will have some stubble to rest on. He lets it dry for about 3 days, and then runs his combine with the air shut off so that he will not lose the very light seed.

Watt's seed has been sold in Illinois, Minnesota, North Dakota, and Colorado, as well as many places in South Dakota. He says more than 2,000 acres in Brookings County have been seeded to Garri-

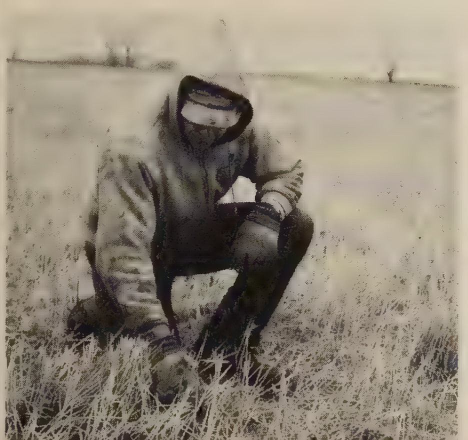
At right, 'Garrison' creeping foxtail produces a high-quality hay readily eaten by livestock. Far right, Greg Watt examines Garrison stubble on a low area.

son. "Most people don't want to bother with taking seed, so they just graze it," Watt said.

After Watt collects the seed, he mows the field for hay. He starts in the center of the field and mows out, going against the wheel tracks in order to get all the hay. He lets it lie in the swath to dry. Then, using a side delivery rake, he bales or stacks the hay right away. Garrison hay is very fluffy and even a slight wind can blow it into the fences.

"There are many areas of low, poorly drained cropland being farmed in this part of the State," Watt said. "If they were planted in a productive grass like Garrison creeping foxtail, just think how much they could help farmers through the dry years."

Mr. Watson is district conservationist, SCS, Brookings, S. Dak.



Meetings:

August

6–9	American Agricultural Economics Association, Blacksburg, Va.
13–16	Conservation Education Association, Logan, Utah
13–16	National Farm & Power Equipment Dealers Association, Calgary, Alberta, Canada
13–17	National Association of County Agricultural Agents, Boise, Idaho
14–18	First International Rangeland Congress, Denver, Colo.
21–25	American Fisheries Society, Kingston, R.I.

September

10–14	International Association of Fish and Wildlife Agencies, Baltimore, Md.
12–16	Federal Bar Association, Washington, D.C.
23–28	Environmental Sanitation and Maintenance Educational Conference, Exposition, Baltimore, Md.
25–28	Interstate Conference on Water Problems, Charleston, S.C.
27–Oct. 1	American Institute of Planners, New Orleans, La.

October

1–6	Water Pollution Control Federation, Anaheim, Calif.
6–10	American Horticultural Society Congress, Nashville, Tenn.
8–10	American Forestry Association, Hot Springs, Ark.
11–13	American Water Works Association, Chesapeake Section, Norfolk, Va.
14–17	Farm and Industrial Equipment Convention, Boca Raton, Fla.
14–18	Congress for Recreation and Parks, Miami Beach, Fla.
16–20	American Society of Civil Engineers, Chicago, Ill.
17–20	National Conference of Editorial Writers, Detroit, Mich.
21–25	American Bankers Association, Honolulu, Hawaii
23–26	The Geological Society of America, Toronto, Ontario, Canada
25–27	Adult Education Association of the United States of America, Portland, Oreg.
26–29	National Association of Biology Teachers, Chicago, Ill.
29–Nov. 1	The Irrigation Association, Palm Springs, Calif.
29–Nov. 2	American Association of State Highway and Transportation Officials, Louisville, Ky.

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Soil Conservation

September 1978

U.S. Department of Agriculture

From the Administrator

The Public Voices Its Concern

All across the Nation this summer, SCS had the unique opportunity, in public meetings related to the Resources Conservation Act, to bring together many people to discuss resource conservation problems.

In meeting the goals of the act, we do not want the ideas and suggestions to be all our own. We need the views which the public gives us. We do not want to overlook considerations that are important to various groups. In addition, we want to know if there is national consensus on what the future of conservation should be.

From the enthusiastic cooperation of sponsoring groups who planned the meetings, we could foresee the success of this public participation effort. The groups included councils and boards of public and private organizations as well as local, State, and Federal agencies. It was encouraging to see the public response in these local meetings and to see people eagerly use the opportunity to express their concerns about land and water conservation.

Participants voiced many concerns. For example, watermelon growers in Utah are concerned about the loss of suitable land for their crops to urban development. Other specialty crop farmers expressed similar thoughts. Such individual problems might never have come to light in a program handled exclusively at the national or State level.

Again and again in the meetings, people spoke of their desire for careful planning for the future of the country's natural resources. Participants stressed the need for a practical balance between conservation and community needs. They also stressed the need to consider costs in planning conservation programs.

And for SCS, an added benefit of these meetings was an opportunity to tell more people about our agency and soil conservation districts. Involving the public in land and water conservation can help immeasurably in developing soil and water conservation programs for the future.

Mel Davis

September 1978, Vol. 44, No. 2

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Soil Conservation

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Secretary of Agriculture

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Soil Conservation Service

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Managing a cypress pond for trees and wildlife is a challenge. See article beginning on page 12. (Photo, Anne Schuhart.)

Farming Above the Arctic Circle

by Roger D. Rayburn

North America's "farthest north" farmers, Bill Fickus and his family, demonstrate Alaska's bright agricultural future.

When the 1896 Alaskan Gold Rush "panned out," many fortune hunters stayed on as farmers. Despite this early influx of homesteaders, agriculture in Alaska never thrived as dramatically as it did elsewhere in the United States. Today, Alaska is pushing hard to develop its agricultural potential.

"Frontier farmers" like Bill Fickus provide much of that push. With his wife, Lillian, and four children, Bill operates a general purpose farm 75 miles north of the Arctic Circle and only 1,500 miles from the North Pole. The family produces grass and grain. They also grow cool-season vegetables like broccoli, peas, and potatoes for sale to nearby villages. They deliver the produce in their own aircraft. The Fickuses hope to expand this part of their operation soon.

Because it is located in a marginal area for agriculture—Crevice Creek in Alaska's Brooks Range—the Fickus farm clearly demonstrates what other farmers could do in more favorable parts of the State. It also provides some of the first important data on an agricultural operation so far north.

More intensive development of Alaskan agriculture will help meet increased world demand for food and fiber. Alaska is located favorably along major shipping lanes in the northern Pacific.

In a recent statewide exploratory soil survey, the Soil Conservation Service identified at least 20 million acres of potential farmland in Alaska. Most of it is undeveloped acreage in the Yukon Valley, 75 miles south of the Fickus farm. Bill Fickus and his family are at least 40 miles beyond any soil area identified as having even marginal agricultural potential.

Yet Bill Fickus did not choose his farmstead at random. He first saw and liked the area while on a prospecting trip in 1958. In July 1963, he returned with Lillian and their family. The children—Debbie, Matt, Linda, and Timmy—now range in age from 12 to 19. All share in the farm chores.

"When we first came here, there was nothing but spruce forest, an old mine, and an airstrip," Bill recalls. "We've added a few things since then." The "few things" include a log cabin, which the family occupied for 5 years; the two-story log house they now occupy; and a large barn. They cut all the logs nearby and hauled them in on a dogsled.

Like an airborne Noah, Bill himself flew in small livestock like chickens, ducks, and turkeys. A professional guide, Bill also maintains a herd of about 10 horses that he uses in his business. The horses would not have made good passengers in the Fickus aircraft. "We trucked the horses to the end of the road and then drove them the rest of the way," said Bill.

At left, Timmy (left) and Bill Fickus with SCS District Conservationist Roger Rayburn examine soils on the Fickus farm. The soils, originally permafrost soils, have thawed with exposure to the sun and produce excellent forage crops. At right, Debbie (left) and Linda Fickus weed the potato patch. The raised beds aid in warming the soil.

Permafrost Soils

Permafrost soils are frozen all year round. Some thaw and drain rapidly after clearing. Others, like those on the Fickus farm, are deep, level, and peaty and are almost impossible to drain thoroughly. They remain cold and soggy, thus limiting the choice of plant varieties and cultural practices. They provide a short growing season and are considered marginal for crop production.

"Except for a curious bear, we didn't have any trouble."

Since 1969, Bill and his family have cleared about 30 acres of land—first with an ax and hand saw, and later with a bulldozer. Because his farm is located many miles from the nearest road, Bill brings much of his farm equipment in by air, in pieces, and then reassembles it.

"We're using basically horse-drawn equipment that we pull with a jeep," Bill reports. "What I haven't been able to find, I've built myself." So far, he has built a plow and is working on a threshing machine.

Behind much of Bill's success is the fact that he recognizes the value of using land within its capability and applying conservation practices in a planned sequence. A cooperator with the Fairbanks Soil Conservation Subdistrict, he worked closely with the subdistrict and with SCS to develop a conservation plan for his farm.

One conservation measure the Fickuses use is a crop rotation schedule. Another is establishing 'Garrison' creeping foxtail as a pasture and hay crop. Garrison is well suited to the cold, wet conditions characteristic of the farm's permafrost soils. Other measures include minimum tillage, crop residue management, and pasture and hayland management.

For planning purposes, Bill's farm offers an interesting opportunity to collect important and useful information for future agriculture in Alaska. Currently, the most northern of Alaska's major agricultural enterprises are concentrated in the Tanama Valley at Fairbanks—about 200 miles south of Crevice Creek.

Back in the Gold Rush days, miners and others living in the Yukon River Valley (about 75 miles south of the present Fickus farm) supplemented their diets with home-grown produce. Later, the Rampart Agricultural Experiment Station was established on the Yukon and grew excellent produce, small grains, and forage crops.

Now, North Slope exploration and the Alaskan pipeline reach into many of these formerly isolated areas. The Alaska Native Land Claim placed about 40 million acres—many of them with agricultural potential—under private ownership.

Long-range planners foresee a positive trend for Alaska's agriculture. Much of the credit will go to people like Bill Fickus and his family. They may be the first of many with the will and ability to succeed in far northern agriculture.

Mr. Rayburn was district conservationist, SCS, Fairbanks, Alaska, and is now district conservationist in Cheboygan, Mich.

Bill Fickus built his plow with truck wheels and iron parts he flew in to his isolated farm and with wood from the area.

SCS Reaches Isolated Communities

by Maximino Díaz

For people in a small Puerto Rican mountain community, resource conservation measures made farming more profitable and the quality of life more satisfying.

Just as the tour books promise, visitors to Puerto Rico find scenic stretches of white, sandy beaches and palm fronds stirring in light equatorial breezes.

Seldom mentioned in the tour books, however, is another part of Puerto Rico. It lies in the rugged, mountainous interior, where residents are isolated by geography and economics from the busy urban centers like San Juan and Ponce. Most of the people in these small mountain communities are farmers, who grow tobacco, coffee, and other crops on the steeply sloping hillsides.

Life there is often harsh and difficult. For at least seven farm families, however, resource conservation provided the key to higher profits and a better standard of living. The seven farms lie in the small community of Ward Pozas, Ciales.

Like many other mountain communities, Ward Pozas faced a combination of adverse conditions that threatened to disrupt traditional farming practices. Erosion depleted valuable topsoil on the hilly landscape. Water often had to be picked up at lower levels and hand carried several hundred feet uphill. Labor for hand harvesting became less available.

Farmers reacted by reducing the acreage devoted to their main cash crop. Consequently, their farm income was sharply reduced.

The seven farm families in Ward Pozas wanted to do something about their problem. As a group, they requested assistance from the Norte Soil Conservation District, which immediately gave the situation top priority. Members of the district board of supervisors visited the area and met with local farmers to assess the situation.

Because of the steep slopes and badly depleted soils, the farmers and district supervisors decided that it would be more profitable to shift to livestock production. A more efficient water supply system also was needed to serve both the new livestock enterprise and farm homes. The district requested technical planning

Farm families in Ward Pozas faced poverty because of poor land and water management.

Near right, water for the community used to be carried several hundred feet uphill from a spring. Far right, a livestock watering tank is part of the new water supply system.

assistance from the Soil Conservation Service.

The farmers, district representatives, and technicians from the SCS field office at Manatí worked together on a plan of action. Its main objectives were to increase annual income and to improve environmental and living conditions in the community. A conservation plan which included the installation and maintenance of recommended conservation practices was developed for each of the seven farms.

The group established improved pastures by planting recommended grass varieties, applying fertilizer and lime based on soil analysis, and by controlling weeds. They also installed permanent fences and adopted good rotation systems to prevent overgrazing.

For a more dependable water supply, the group developed a permanent existing spring. The system consists of a spring box, an 8,000-gallon water storage tank, 12 troughs, and 11,360 feet of pipeline.

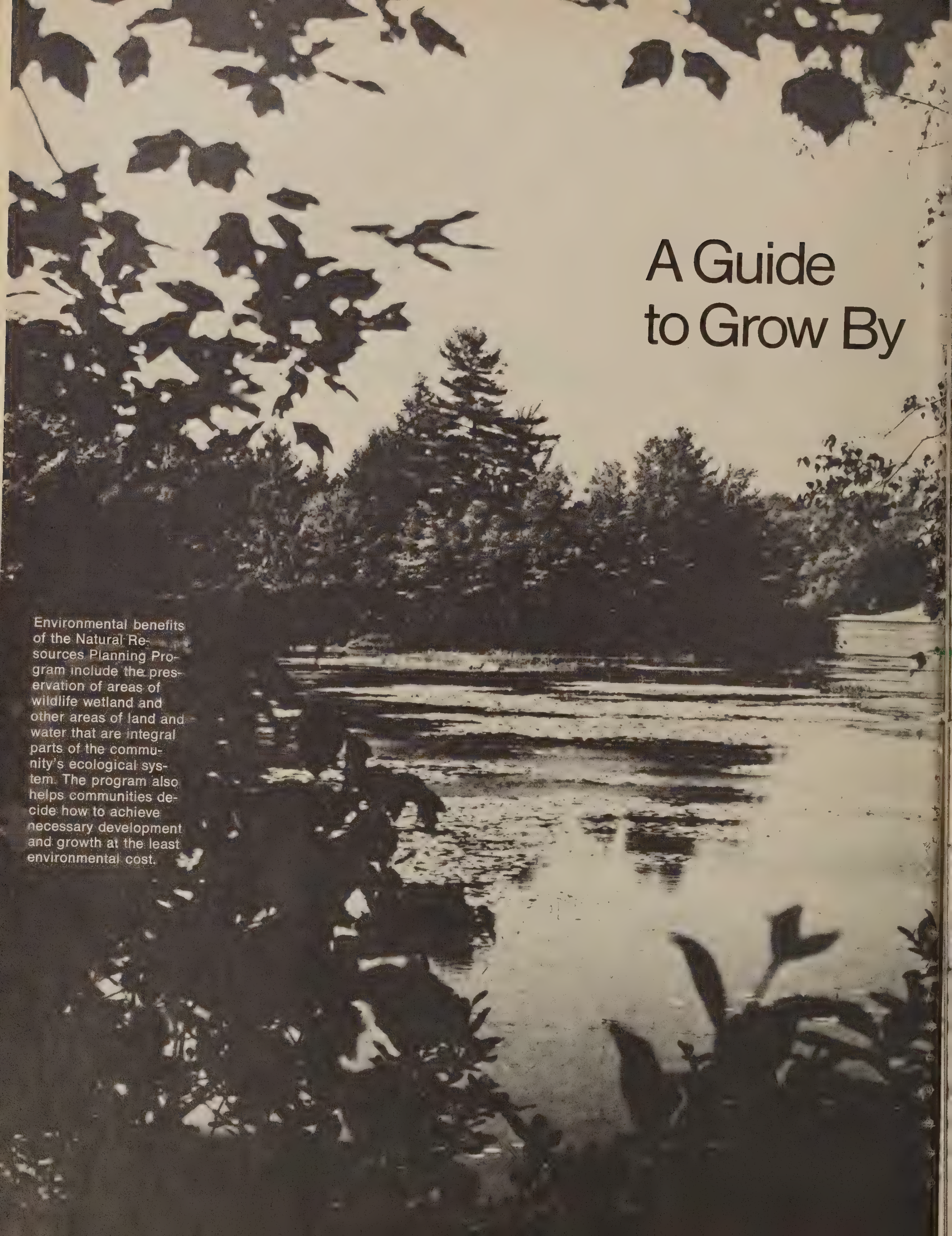
After months of hard work, the project was completed. Today, all seven farms have conservation agreements with the district, and benefits are much in evidence.

Annual community income has more than doubled. Because more than 100 acres of improved pastures have been established, soil erosion has been reduced considerably. The new water supply system has brought significant improvements in health and sanitation. Farmers now are less inclined to leave the community in search of a better life elsewhere.

Many of the farmers in Ward Pozas say they will continue to establish conservation practices as long as they own their farms. That idea may be catching on. Other groups are now indicating interest in organizing similar projects.

Mr. Díaz is district conservationist, SCS, Manatí, P.R.

A Guide to Grow By



Environmental benefits of the Natural Resources Planning Program include the preservation of areas of wildlife wetland and other areas of land and water that are integral parts of the community's ecological system. The program also helps communities decide how to achieve necessary development and growth at the least environmental cost.

The natural resources planning program in Massachusetts provides tools growing communities can use to make sound land-use decisions.

by Susan P. Alward

From left to right, Edward Himlan and John Joyner, graduate students in regional planning at the University of Massachusetts, and Frederic Giebel, SCS soil conservationist, study an MNRPP soils map which is an important tool in setting and meeting a community's goals for natural resource use and conservation.

Massachusetts population grew by about 1 million persons between 1950 and 1970, and the amount of urban land nearly doubled. Large amounts of agricultural land were lost as people sought the "good life" in suburban and rural areas.

Many towns grew so rapidly and indiscriminately that the qualities which had made them desirable places to live were threatened. Town governments needed a way to deal with the problems inherent in growth. For example, they needed help in determining the best site for a sanitary landfill or a new shopping center. They needed help in deciding how to provide housing and still retain open space.

To help towns in Massachusetts, the Soil Conservation Service developed a guide to making wise land-use decisions—the Massachusetts Natural Resources Planning Program (MNRPP).

The MNRPP gives local decision-makers tools to chart a course for their community's future growth. The program helps citizens make sound land-use decisions by providing methods and technical assistance to inventory, evaluate, and analyze their community's natural resources.

The program depends on community volunteers and local government leaders. To sign up, a town board or citizen group must first request information about the MNRPP from the local conservation district.

At meetings, specialists from USDA's Science and Education Administration and SCS help conservation districts explain the program and answer questions.

One question frequently asked at the meetings is: "How much will it cost our town?" Costs are primarily for materials and supplies. For most Massachusetts communities these have run between $500 and $1,000 depending on the number, quality, and size of maps selected and on the number of reports published.

Most technical support services and assistance are provided by the Natural Resources Technical Team (NRTT) without charge. The team is made up of people from State and Federal natural resource agencies. The teams usually include representatives from SCS, the Science and Education Administration, the Massachusetts Division of Forests and Parks, and the Massachusetts Division of Fisheries and Wildlife.

Through cooperative agreements between SCS and the University of Massachusetts, Harvard University, and Yale University, graduate students also assist MNRPP communities.

After a community decides to go ahead with the MNRPP, it submits an application to the conservation district. To be considered for the program, a community must have a soil survey completed or underway.

When the conservation district board agrees to assist a community, the district board, the community, SCS, and other NRTT agencies sign a memorandum of understanding which outlines each group's commitments. The regional planning agency and any other agencies that will help the community in the program may also sign.

The community then organizes a

Through MNRPP, towns inventory their recreation land and water and, according to their needs, plan to improve existing recreation areas or add new ones.

Hiram Peck, a student intern from the University of Massachusetts, examines an inventory map of historic sites. The map enables a community to plan development around areas it wants to preserve. The burial ground in Holden, Mass., dates back to colonial times and is on the National Register of Historic Places.

steering committee made up of representatives of local boards or commissions and interested citizen groups. The steering committee provides overall guidance for the community's MNRPP activities. The steering committee also appoints a program coordinator who insures that the many volunteers work as an effective team.

"Being an MNRPP coordinator is a fun project," said Lois Simmonds, the coordinator of North Andover's program. "But the coordinator needs to be energetic, perhaps have some experience in administration, and have lots of spare time."

The next step, making an inventory of the community's natural resources, involves citizen volunteers in collecting data and preparing maps that show the quantity, quality, and distribution of such resources as agricultural land, recreation land and water, wildlife land, wildlife wetland, and woodland.

The steering committee organizes 8 to 10 inventory committees of 2 or 3 persons each. The NRTT guides them in conducting field inventories and in compiling inventory maps. Volunteers are trained to recognize and record problems related to their community's natural resources.

During the inventory phase of the program, the NRTT also prepares any technical studies and maps that need to be made.

The inventories may be completed in a summer of intensive work or take several years. When all the inventories are completed, maps of individual resources are combined in a Present Land Use Map.

Maps showing historic sites, ecologically sensitive areas, or prime agricultural land may also be made. Combinations of these maps, with soil interpretations maps, are used to develop alternative courses of action for towns and to determine possible effects of proposed actions.

Meetings are held to acquaint the public with the inventory committees' findings. Keeping in mind the community's goals and needs, the areas best suited for future growth and development are identified.

Anyone can volunteer to join an inventory committee. Many people fit the inventory work around full-time jobs. On the island of Martha's Vineyard, many retired people helped with the MNRPP inventories in the town of West Tisbury.

"After all the inventory information is collected and organized, trends are delineated, problems identified, and opportunities for protection or improvement of natural resources explored," said Pat Hawley, an MNRPP participant.

"This lays the groundwork for natural resources information to be used as part of a community's daily planning process. It helps translate information gained through the program into a way-of-life philosophy. As a result, communities have a much stronger foundation and better tools to direct future growth."

The community charts a course of action based on the accumulated information and recommendations. Individual boards may prepare special purpose plans for conservation, outdoor recreation, sewer facilities, or other projects.

MNRPP also provides the information town officials need to decide on sites for public facilities, and it enables citizens and officials to work for preservation of what they consider valuable—such resources as wetlands, wildlife habitat, agricultural lands, and scenic views.

In the 5 years that the MNRPP has been used, more than 47 towns throughout Massachusetts have entered the program. The benefits have been many. Lenox, in the Berkshire Hills of western Massachusetts, used its MNRPP information to find a suitable landfill site.

Acton, a pilot town in the program, used the information to preserve some agricultural land. "The MNRPP information enables our town to make sound decisions about growth, instead of just reacting to it," said Rick Sherman, Acton's planner.

The town of Dennis on Cape Cod used MNRPP maps, information from their visual resources survey, and soil survey data in a 1977 revision of its town plan and zoning ordinance.

Each town that enters the program has done things a little differently, according to its needs. "The flexibility of the MNRPP is a primary factor in its success," said Mary Grimes, program coordinator for the town of Westminster.

Through MNRPP, townspeople gain a better understanding of their valuable natural resources. They know what they have and can decide what should be protected, and where development can safely occur. They are equipped with the knowledge they need to make sound land-use decisions.

The Natural Resources Planning Program is an ongoing process. Continued technical assistance is available from SCS and other NRTT agencies.

The Natural Resources Planning Program was designed by SCS for Massachusetts, but it can easily be adapted to towns and communities everywhere.

Ms. Alward is public information officer, SCS, Amherst, Mass.

Cypress Pond Attracts Wood Storks

by Anne Schuhart

The owners of a farm pond in Florida were pleasantly surprised when the pond attracted several species of birds including one on the State's list of endangered wildlife species.

When a Florida couple asked the Soil Conservation Service to plan a pond on their farm, they had no idea it would attract wood storks, which are on the State's list of endangered wildlife.

In 1964, Mr. and Mrs. W. H. Fitzpatrick asked SCS to plan a pond in a 45-acre depression on their farm in Hardee County, about 50 miles southeast of St. Petersburg, Fla.

The job was routine, except that the Fitzpatricks wanted to preserve two stands of pondcypress, called cypress domes, in the depression. Although cypress trees tolerate water better than other trees, they still must dry out sometimes.

To allow the trees to dry out, SCS designed a canal 20 feet wide and a levee around the depression. Water is 10 feet deep in the canal but only 2 to 3 feet deep under the trees in the center of the pond. An outlet with a flashboard riser was built to enable the owners to fluctuate the water

Wood storks build their nests during January through March with material such as live and dead cypress twigs, Spanish moss, wax myrtle, and saltbush which they gather at the site.

level by about 2 feet to preserve the trees.

The Fitzpatricks then designed a house and landscaped their long, sloping yard to take full advantage of the view of their new pond. They stocked the pond, and within a few years they were catching fish.

But something else was happening in the cypress pond. Herons, egrets, and white ibis began roosting and nesting in the cypress trees.

As the bird population grew, the amount of bird manure dropping into the water also increased. The nitrogen and phosphorus enriched the water so much that algae and other aquatic plants began to overproduce. By 1968, the lake became eutrophic, and the lack of oxygen in the water killed all the fish except catfish and gar.

That same year, a colony of wood storks came to the cypress pond, built 25 nests, and raised their young.

To find out why the wood storks were attracted to the cypress pond, Pete Heard, SCS environmental coordinator for Florida, studied their nesting habits.

"One reason wood storks are on Florida's list of endangered species is that their breeding behavior is so closely tied to the fluctuation of the water level in feeding areas," Heard said.

"If the water level is too high, wood storks won't nest," he explained. "When the water level is low, fish are concentrated in a smaller area. This makes it easier for the storks to feed and to feed their young. One parent stays with the nest while the other feeds, returns to the nest, and feeds the young by regurgitation.

"On the other hand, wood storks won't nest successfully unless there is some water, at least a foot deep, under the trees to protect the nests from raccoons, opossums, skunks, and other egg-eating predators.

Dead trees play a role in the wood storks' habitat. The birds prefer them for perching and resting.

"For example, in 1974, the water level in the cypress pond was allowed to remain low during the breeding season, which begins in February. On March 17, I observed about 15 nesting pairs of wood storks, but the water continued to recede. By May, when water remained only in the canal, all the wood stork nests were deserted, and no herons, egrets, or ibises were roosting or nesting there either.

"We pumped water into the pond, and rainfall helped bring the water level up again. Several thousand white ibises and cattle egrets returned to roost by mid-July, but the wood storks didn't return until the next year."

In Florida, the water table in natural cypress depressions fluctuates according to seasonal rainfall. It is generally below ground level from November through April and higher from June through August.

With the levee and flashboard

Egrets are also attracted to the cypress pond to nest. The open pasture near the pond provides the main part of their diet, grasshoppers and insects.

An outlet with a flashboard riser enables the owners to change the water level in the pond by about 2 feet.

riser, however, the water level can be manipulated to accommodate both the wood storks and the cypress trees. The pond is filled in January and maintained until the last birds leave the nests in August. The water level is allowed to drop during the fall.

About every 5 years, the pond is drained in July or August. The cypress dry out more thoroughly and excess organic material that has built up decomposes before water is pumped in for the next breeding season.

The younger trees have adapted well, but a few of the older trees have died even with the careful management.

"This cypress pond shows that man can create just as dependable a nesting place as nature," said Heard. "In fact, by manipulating the water level and managing the vegetation, man can create perfect breeding and nesting conditions every year.

"The pond has been a tremendous boon to this wood stork colony," he continued. "I haven't done a nest count this spring, but in 1977 more than 500 pairs of wood storks nested there. They averaged three young birds to a nest, which is very good because wood storks usually average only two young per nest."

The last count also showed some 6,000 cattle egret nests, more than 75 anhinga nests, 50 American egret nests, and about a dozen little blue heron nests. Heard also observed white ibis, wood duck, Florida gallinule, and red-winged blackbird nests and otter dens.

Louisiana heron, great blue heron, little green heron, yellow-crowned night heron, coots, purple grackle, red-bellied woodpecker, and barred owl feed or roost at the pond.

"The pond also attracts many migratory ducks," Heard said. "Blue-winged teal in particular use the pond as a stopover to and from their wintering grounds in South America."

In addition, alligators up to 10 feet long nest and raise young at the cypress pond. The alligators help keep predators away from the bird nests. They also, no doubt, consume any unfortunate young that fall from the nests.

Open pasture next to the pond provides food and nesting material for many of the birds. Grasshoppers and other insects, for example, make up about 80 percent of the cattle egret's diet.

The property has changed hands three times since the pond was built. But each time it was sold to people who valued the opportunity to observe wildlife from their living room.

Ms. Schuhart is a writer-editor, Information Division, SCS, Washington, D.C.

Two cypress domes frame the pond owners' house. The original owners landscaped the yard to take full advantage of the view of the pond.

Wood Chips for Fuel

by Patricia A. Paul

New York's fuel-shy North Country may have a home-grown answer to its energy needs—wood chip fuel from waste forest materials.

As coal and petroleum supplies dwindle, energy experts across the country are looking at solar, wind, nuclear, and other energy sources.

For New York's North Country—Lewis, Jefferson, Franklin, and St. Lawrence Counties—the energy answer may be wood chips.

The North Country can use all the energy help it can get. It is in a remote location with cold winter temperatures and a depressed economy. It is a "have-not" area in fossil fuels; imports of coal, oil, and gas drain badly needed dollars from the local economy.

What it does have is plenty of wood, much of which can be classified as waste—sawdust and bark discarded by sawmills, fallen trees, or other unmarketable trees. This "waste" shows promise as a commercial and industrial fuel that also is economical, readily available, and of uniform heat value.

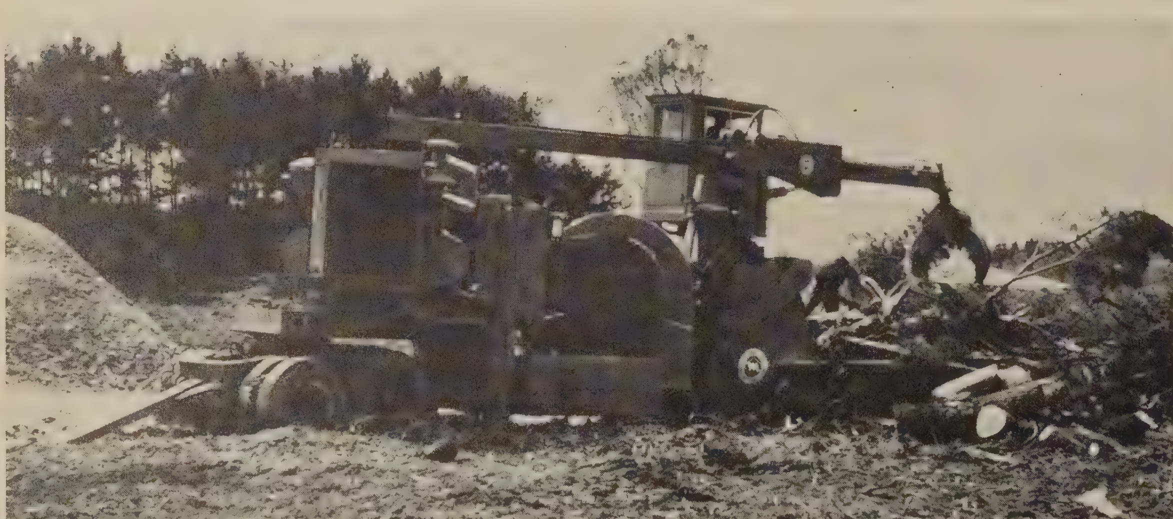
Out of this background grew the "wood chips for fuel" project—a cooperative effort of the Black River/St. Lawrence Resource Conservation and Development (RC&D) Area, Clarkson College of Technology, and the New York State Legislative Commission on Energy Systems.

It started as a local effort; but Steve Payne, RC&D coordinator for the Soil Conservation Service, reported that a recent conference for firms considering using wood chips as fuel brought 200 people from as far away as Alabama and British Columbia.

Does wood-for-fuel deplete supplies for furniture, housing materials, and other industry products? No, said Don Neuroth, wood marketing and utilization specialist hired for the project. Nearly all the chips represent wood that no one else wants. Neuroth said that it also may be possible to develop fast-growing cash crop trees just for chips, as Canada has tested with poplar.

Is there enough waste wood in the North Country for the whole area to use as an energy source? Neuroth said yes. "There are about 75 million tons of waste wood available for fuel in the four counties. Some 2 million tons per year would provide sufficient energy for everyone in the area without damaging forest resources. This 2 million tons of wood could replace 833,000 tons of coal or 166 million gallons of oil."

According to Neuroth, less than half of each tree harvested now reaches market. About 40 percent is left in the woods to rot. Of the 60 percent that reaches the mill, only about 30 percent becomes lumber,



A whole tree chipper can process a 22-inch diameter tree, from 40 to 60 feet long, in 45 seconds.

Courtesy Syracuse Supply Company, Syracuse, N.Y.

furniture, or other products. About 20 percent ends up as sawdust and bark and 10 percent as pulpwood. The "wood chips for energy" project focuses on the unmarketable materials.

For many areas of the Northeastern United States, the use of wood chips for fuel offers several advantages over current energy sources:

- Increased logging and hauling would boost local employment.
- Fuel dollars now spent for coal and oil would remain in the area to bolster the local economy.
- Removing dead and dying trees would give healthy trees more room to grow.
- With plentiful wood supplies close by, local businesses could stockpile a 1- or 2-month supply of wood chips, instead of a year's supply of coal.
- Air quality in the Northeast should improve, since wood energy systems do not produce sulfur, as burning coal does.
- With less dependence on fossil fuels, the North Country would contribute to national energy conservation goals.

How difficult is it for a business to convert to wood chip energy—or, more technically, a "biotherm system"? Neuroth estimated that it takes about 3 to 4 months to convert a small boiler and up to a year for a bigger system. The expense can be recovered in 5 to 10 years, sometimes less.

Advances in wood harvesting equipment also are making wood energy systems more practical. Today's machinery can gobble up whole trees and reduce them to uniform-sized wood chips. Then, it can clean out dirt and sand and blow the chips into transport vans, which can be loaded and unloaded in minutes.

"With about 70 wood-processing plants in the North Country," said Neuroth, "it shouldn't be too difficult to set up a delivery system capable of meeting an increased demand."

Some wood-using industries in the North Country—like the AMF plant at Lowville and the Harden Furniture factory in McConnellsville—already use their waste wood as fuel. Harden previously consumed 350,000 gallons of oil every year. Now, it uses wood byproducts from furniture manufacturing to heat its plant.

"The challenge to our project," said Neuroth, "is to get needed information to more industries on how to take advantage of wood as an energy resource."

Late in 1977, project officials contacted every major industry in the North Country to find out how much interest there was in using wood for fuel. Response was almost 100 percent positive, although everyone agreed on the need to compare alternatives. A symposium sponsored by the project groups was well attended, and at least six local businesses now are planning for conversion to wood for fuel within the next year or two.

A few years ago, a study conducted in Vermont indicated there was enough surplus unmarketable wood fiber there each year to meet a substantial portion of the State's annual energy and heating needs. The study also reported that this surplus wood—if it were removed with proper forest management practices on a large scale—would improve the productivity, health, wildlife habitat, and appearance of woodlands, without causing environmental damage. The report concluded that a number of pilot projects are needed to take wood-for-fuel out of the theory stage. It may be past the theory stage soon. Burlington Electric, Waterbury State Hospital, and the Georgia Pacific Paper Company already use wood for fuel in Vermont. Work in the North Country of New York will test the concept further. The "wood chips" approach may prove workable in other areas that are poor in fossil fuel but rich in wood resources.

Wood chip fuel is only part of the solution to the Nation's energy problems: What works well in the North Country may not work in major metropolitan centers, such as New York City. Yet woodland covers more than half of New York State and more than three-quarters of Vermont. With plenty of wood for fuel, these and similar areas in the Northeast could change from "have-nots" to "have-lots" when it comes to energy in the 21st century.

Ms. Paul is public information officer, SCS, Syracuse, N.Y.

4-H Club Boosts Conservation

by Fred L. Trump

With a conservation demonstration farm as the focus of their interest, members of the Sunny Valley 4–H Club of Salina, Kans., became active conservationists at an average age of 11 years.

Members of the 4–H club carried out several projects for wildlife. They built brush piles (top) and planted trees and shrubs (bottom) for wildlife cover.

Most of the 20-some members of the Sunny Valley 4–H Club of Salina, Kans., are "city kids."

But their interest in resource conservation extends to rural and urban needs. Their interest surfaced within the club about 4 years ago. It took on added meaning 2 years later, when members decided to concentrate their conservation efforts on improving the Saline County Conservation District's 30-acre demonstration farm, 6 miles southeast of Salina.

In 1954, the district bought an 80-acre tract and used 30 acres as a demonstration farm and as a study area for school groups. The other 50 acres were rented to a farmer who uses conservation practices in his crop rotations.

The job proved a formidable challenge for a group of youngsters whose average age was 11, even with several high school students helping as guidance counselors.

Over the years, the cropland continued to be planted and conserved. However, interest had waned in the demonstration acreage. By the time the Sunny Valley 4–H'ers took an interest, only about 10 school groups each year used the farm as a conservation teaching aid.

When club members first toured the farm, they noticed that signs identifying the land as a demonstration area for conservation had disappeared. They found the farm pond badly silted from offsite runoff. But they also noted that the farmer-renter continued to maintain terraces and grew crops on the contour.

After the tour, members discussed

ways to rehabilitate the demonstration areas. Before presenting their proposals to the district board of supervisors, they selected a committee to discuss their ideas with the Soil Conservation Service's District Conservationist, Duane Goerend. The club members wanted to: replace the identifying signs; plant more trees and shrubs for education, beauty, and wildlife protection; establish a well-defined nature trail; find a way to prevent further silting of the farm pond; and erect a barrier to prevent vehicles from driving through a waterway and tearing up the sod.

Goerend was impressed. He felt that most of the proposals were sound and feasible. He was less optimistic about the silted pond and auto track problems, and his concern was justified: neither problem has yet been resolved successfully.

Next, then-Club President Ken Houchin appeared before the district board of supervisors to present the suggestions. The board was also favorably impressed.

The supervisors supplied a metal sign and paint, and club members painted and lettered the new sign identifying the acreage as a demonstration farm. Then, assisted by some of their fathers, District Chairman Herman Will, and Goerend, they installed the sign at a corner of the farm where two roads meet.

Over the next 2 years, the district supervisors bought 300 trees and shrubs for areas "assigned" to wildlife. The trees and shrubs included Russian olive, hackberry, honeysuckle, Scotch pine, Chickasaw plum, autumn olive, Nanking cherry, and fragrant sumac. Each spring, club members did the planting.

To establish the nature trail, the club purchased and installed six, 3-inch-wide, treated "reference posts" to mark points of interest. Members plan to add six more posts. All 12 will extend about 1½ feet above the ground. When the trail is completed, visitors can take a self-guided tour by listening to a recorded narration and referring to a duplicated instruction sheet or trail guide, on which points of interest have been numbered. Club members will paint a number on each reference post to correspond to numbers shown on the trail guide.

Using the trail guide, instructors can help students identify grasses, trees, shrubs, and other plants; soil types; wildlife habitat; and conservation practices like terraces, grassed waterways, erosion control dams, contour farming, and windbreaks. Although the trail covers only the 30 acres used for demonstration, some conservation practices on the 50 cropland acres will be visible at points along the way.

Club members expect the demonstration farm to give visitors a greater appreciation for the environment and a stronger insight into relationships among plants, animals, natural resources, and man.

While many of its activities center on the demonstration farm, the club also conducts other conservation projects. In the 2 years before they settled on the farm project as the focus of their conservation activity, some members took photographs of various conservation and land-use problems within the city of Salina. They discussed these problems on local radio and television shows. Two members took color slides of trees and shrubs in Salina parks and presented sets of the slide series to the Salina school system, the county extension office, and the local SCS office.

A club committee visited city officials to discuss bicycle paths in city parks and baseball diamonds in unused flood plain areas. All members helped raise funds for their activities by collecting newspapers and aluminum cans for recycling.

Even after the demonstration farm began occupying a large portion of their time, club members continued their other conservation efforts. With money from their recycling activities, they purchased and planted shrubs in members' back yards for songbird food and cover. Among the shrub species they selected were eastern redcedar, tatarian honeysuckle, coralberry, golden elder, aromatic sumac, and redosier dogwood.

They also purchased wildflower seeds, grew the flowers indoors, and then set out the plants at the demonstration farm and along rural roadsides. Wildflower varieties included black samson, thickspike gayfeather, purple-prairieclover, pitcher sage, compassplant, and lespedeza.

Members actively promote conservation and publicize the demonstration farm on radio and television.

Mr. Trump is public information officer, SCS, Salina, Kans.

Helping Mountain Homes Hold Their Yards

by Robert V. Carter, Jr.

Using a hydroseeder to plant a cover of grasses helped hold the soil on steep building lots in the Appalachian Mountains.

The Qualla Housing Authority of the Eastern Band of the Cherokee Indians carved building lots for 175 houses out of mountainsides in western North Carolina.

The housing authority is building the modern, brick houses as part of a self-help project for the Cherokee Indians. The houses are being built on Indian-owned land in the Appalachian Mountains under a loan from the U.S. Department of Housing and Urban Development.

The project will enable some Cherokee Indian families to move out of substandard housing.

The Indians make a downpayment on one of the houses by working 500 hours helping to clear the land, cleaning up after the workmen, or helping at the prefabrication plant where sections of the houses are assembled.

The building lots for the houses presented the biggest problem for the Qualla Housing Authority. The lots look like notches cut out of the hillside. The backyards climb steeply and the front yards fall away with the natural slope of the mountain. Erosion and sedimentation were severe problems.

The housing authority needed a quick, effective way to stabilize the bare earth. So they went to the Soil Conservation Service for help. SCS recommended using a high-pressure hydroseeder to plant the steep yards.

The Tuckaseigee Soil and Water Conservation District (SWCD), which serves mountainous Swain County, owns a truck-mounted hydroseeder which is ideal for planting steep slopes. The district uses it to plant roadways, building lots, and other areas needing critical treatment.

While each house in the project is being built, the hydroseeder is moved in and a mixture of water, mulch, fertilizer, lime, and grass seed is sprayed on the steep yards.

In just a few months, a lush grass cover of Kentucky 31 fescue stabilizes the yards.

The hydroseeder helped solve one of the most critical conservation problems in Swain County, according to the Tuckaseigee SWCD and SCS.

Mr. Carter is district conservationist, SCS, Bryson City, N.C.

A hydroseeder is used to plant Kentucky 31 fescue which will help stabilize the steep backyard.

Helicopter Helps Dam Builders in Wilderness Area

A helicopter delivers a 3-ton bucket of concrete to build a replacement for a 70-year-old dam in Montana's Selway-Bitterroot Wilderness. Low water during the 1977 drought gave farmers the chance to rebuild the dam. In normal years, the dam stores 3,000 acre-feet of irrigation water in the Big Creek Lakes.

Use of the helicopter made roadbuilding unnecessary through the wilderness and won the blessings of environmental groups. The Soil Conservation Service designed and inspected the dam. Cost-share funds were provided by the Agricultural Stabilization and Conservation Service under the drought-assistance program. The chopper made more than 40 trips with materials and supplies.

Youth Learn to Be at Home on the Range

by Eugene J. Handl and Brad Anseth

Five years ago, a group of ranchers started a camp for city and country youth. Today, the camp is producing winners.

The Montana Youth Range Camp is sponsored by the Dawson County, Mont., Rangeland Resource Committee and the Northern Great Plains Section of the Society for Range Management.

"The camp was established to call attention to the importance of the rangeland resource and to educate youth to its proper use," explained Willy Milliron, rancher and resource committee chairman. The camp is open to youths between the ages of 14 and 18, and they may attend more than 1 year.

Three of the camp's participants—Richard Bonine from Miles City, Lane Carroll from Ekalaka, and Richard Sparks from Plevna—participated in a regional range judging contest in Rapid City, S. Dak., in 1976.

"We won first place in the open competition at the regional contest and we owe it to the range camp," said Sparks.

Richard Bonine, who attended camp for his third year in 1977, said, "The first year I attended the camp, I was lost. Now, with the background the camp has given me, I want to go to college and study range management."

Two 1977 camp attendees, Roger French and Lee Jacobs, were members of the Montana team at the 1977 National Range Judging Contest in Halsey, Nebr. The team won first place in the 4–H Division of the contest and Roger French was high point individual in all divisions.

SCS Range Conservationist Robert Ross explains to range camp participants how to identify range sites by the soils and plants.

In early 1978, French and Jacobs, along with their other team members, went on to the International Land, Pasture, and Range Judging Contest in Oklahoma City, Okla., where they took first place in the pasture and range judging contest.

For the past 2 years, the Old West Regional Commission, a partnership among the Federal government and State governments of Montana, Wyoming, North Dakota, South Dakota, and Nebraska, has provided grants to operate the camp. Montana soil conservation districts sponsor some of the youths.

Instructors for the sessions include area ranchers and specialists from Montana State University; the Montana Fish and Game Department; USDA's Science and Education Administration and Soil Conservation Service; and private companies. Most are members of the Society for Range Management.

The instructors take the participants to range sites and teach them basic soil types and their potential. The participants learn how to identify plants and put them into their proper category of forb, shrub, sedge, or grass. They also learn how to determine if plants are palatable, poisonous, or pest.

In sessions on range ecology, they learn how plants react to grazing pressure and the influence of livestock and wildlife. The youths eventually take their own plant clippings and determine range condition and degree of use.

For 5 years, the camp was held at a State park near Glendive in eastern Montana. In 1978, the camp was moved to Deer Lodge to allow more youths from western Montana to attend.

Mr. Handl is range conservationist, SCS, Miles City, Mont.
Mr. Anseth is public information officer, SCS, Bozeman, Mont.

News Brief

President Carter Calls for 25 New Small Watershed Projects

President Carter included in a supplementary budget request to Congress funds to finance 25 new small watershed project starts by the U.S. Department of Agriculture's Soil Conservation Service (SCS), according to M. Rupert Cutler, assistant secretary of agriculture for conservation, research, and education.

The 25 projects will cost a total of $75 million, with the President requesting an initial outlay in fiscal year 1979 of $6 million. This is in addition to a previous 1979 budget request of $142,522,000 to continue construction on 528 small watershed projects already underway.

The projects will be selected by SCS during the coming fiscal year. All will be eligible for funding as local sponsors complete preparations for construction.

The new starts were recommended by President Carter as a followup to the administration's new water resource policy.

Cutler said the President's water policy message also gave SCS approval to fund 80 percent of the cost of nonstructural measures in small watershed projects. Up to now, nonstructural measures have been paid for entirely by local sponsors.

So called "nonstructural measures" include zoning, land-use constraints, relocation of flood plain structures, purchase of flood plains for public use, and floodproofing.

Meetings:

September

10–14	International Association of Fish and Wildlife Agencies, Baltimore, Md.
12–16	Federal Bar Association Convention, Washington, D.C.
23–28	Environmental Sanitation and Maintenance Educational Conference, Exposition, Baltimore, Md.
25–28	Interstate Conference on Water Problems, Charleston, S.C.
27–Oct. 1	American Institute of Planners, New Orleans, La.

October

1–6	Water Pollution Control Federation, Anaheim, Calif.
6–10	American Horticultural Society Congress, Nashville, Tenn.
8–10	American Forestry Association, Hot Springs, Ark.
11–13	American Water Works Association, Chesapeake Section, Norfolk, Va.
14–17	Farm and Industrial Equipment Convention, Boca Raton, Fla.
14–18	Congress for Recreation and Parks, Miami Beach, Fla.
16–20	American Society of Civil Engineers, Chicago, Ill.
17–20	National Conference of Editorial Writers, Detroit, Mich.
21–25	American Bankers Association, Honolulu, Hawaii
23–26	The Geological Society of America, Toronto, Ontario, Canada
25–27	Adult Education Association of the United States of America, Portland, Oreg.
26–29	National Association of Biology Teachers, Chicago, Ill.
29–Nov. 1	The Irrigation Association, Palm Springs, Calif.
29–Nov. 2	American Association of State Highway and Transportation Officials, Louisville, Ky.

November

7–10	Future Farmers of America, Kansas City, Mo.
11–13	National Agricultural Plastics Association, Miami Beach, Fla.
12–15	National Association of State Universities and Land Grant Colleges, St. Louis, Mo.
12–15	National Forest Products Association, Palm Beach, Fla.
12–16	American Institute of Chemical Engineers, Miami, Fla.
13–17	National Conference on Urban Forestry, Washington, D.C.
13–20	The National Grange, Denver, Colo.
19–22	American Society of Landscape Architects, Atlanta, Ga.

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Soil Conservation

October 1978

U.S. Department of Agriculture

Meeting the Challenges of the Rural Clean Water Program

From the Administrator

The roles of State soil and water conservation agencies and State water quality agencies, conservation districts, and SCS in implementing Section 35 of the Clean Water Act of 1977 are much discussed these days.

But little is heard about the important role of another participant in the effort—the land improvement contractor. The need for construction technology and talent in soil and water conservation activities will increase as the Rural Clean Water Program (RCWP) gets underway.

Private land owners and operators who voluntarily enter into long term, cost-shared contracts under RCWP will need help from contractors on the structural measures needed to prevent or reduce nonpoint agriculture-related pollution of our Nation's waters. Some will need help with installing, operating, and maintaining best management practices (BMP's).

Although BMP's often include soil conservation measures familiar to land improvement contractors, these improved systems also include other practices not so familiar. Private landowners will engage contractors, as needed, to carry out work under the contracts, subject to standards and specifications established by SCS.

As we embark on the new water quality program, we are fortunate to have available the largest pool of land improvement contractors in our history. The growth of the group has paralleled and been a part of the development of the conservation movement in the Nation.

By 1951, there were enough contractors specializing in land improvement all over the country to found their own national organization, the Land Improvement Contractors of America (LICA). Contractors are organized in 39 States, including 5 New England States combined in a single chapter. The national group today has more than 3,400 members.

Some of the contractors started out as farmers, then began construction work part time. Many continue farming and many are small, independent operators, with a personal stake in the well-being of rural America.

SCS and LICA share many common objectives for conservation of land and water resources, and our working relationship is well established. For the past 16 years, for example, we have shared a responsibility for training contractors in new conservation techniques and procedures by jointly sponsoring an annual series of winter workshops in all sections of the country.

We should strive to improve and strengthen our communications and relationships to assure the success of the Rural Clean Water Program and other activities. SCS, conservation districts, and land improvement contractors have an obligation to cooperate closely to meet the challenges ahead.

Mel Davis

October 1978, Vol. 44, No. 3

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Soil Conservation

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A soil scientist dips soil samples to coat them with saran to stabilize them and to retain moisture. (Photo, John Cross.)

Back cover:
A physical science aide removes a soil sample from the drying room at the National Soil Survey Laboratory. (Photo, Gene Alexander.)
See article beginning on page 4.

Unearthing the Soils' Secrets

by John M. Cross

National Soil Survey Laboratory scientists help soil scientists in the field by making detailed soils studies. They also develop better ways to predict soils' performance and techniques for using soils data in evaluating potential uses of soil resources.

Soil scientists have a lonely job. They go out into the fields to map the soils with only the few pieces of equipment they take with them. Sometimes the soils are reluctant to give up their secrets and sometimes they don't fit into neat categories.

That's when soil scientists need help. In the 1950's, the Soil Conservation Service established three soil survey laboratories to help SCS soil scientists with their field work. In 1975 and 1976, the three laboratories —which were located in Riverside, Calif.; Beltsville, Md.; and Lincoln, Nebr.—were consolidated into the new National Soil Survey Laboratory (NSSL) at Lincoln.

Every year, the 19 NSSL scientists and their supporting staff make more than 75,000 soil analyses, supply data and technical assistance on hundreds of soil survey problems, conduct dozens of detailed soil studies, and develop techniques for using soils data in evaluating potential uses of soil resources. They also have leadership in developing and improving methods of soil analysis and in coordinating procedures used by other soils laboratories.

When SCS soil scientists need information to supplement their field measurements of soil properties, they send soil samples to the NSSL for quick physical, chemical, and mineralogical analyses. When laboratory analyses alone are not adequate, the NSSL scientists perform field investigations, particularly in areas of unusual geology.

Some questions about soils cannot be answered easily. As landowners and others become more and more concerned about natural resources, they need new and more accurate soil performance predictions. As a result, soil scientists at NSSL have developed new equipment that will provide additional field measurements during soil mapping. Reuben E. Nelson recently perfected a simplified field kit for rapidly evaluating soil salinity and sodium content. George Holmgren developed a sophisticated kit for making field measurements of chemical properties. Holmgren's kit is now widely used across the Nation by SCS soil scientists and others.

Many soils problems require combined field and laboratory studies. Currently, NSSL Soil Scientists Robert B. Grossman, Ronald F. Paetzold, and Sam J. Ross are working with USDA's Science and Education Administration scientists to develop more precise field and laboratory measurements of water transmission and storage properties of soils. Other NSSL scientists work with soil scientists from SCS Technical Service Centers and State and local offices to study soil distribution patterns. These efforts increase the efficiency and accuracy of ongoing soil surveys.

In addition to helping soil scientists with their field work and solving

At left, a block of undisturbed soil is removed from a 7-foot-deep pit. The soil sample will be sent to the National Soil Survey Laboratory for analysis.

NSSL Soil Scientists Sam Ross (left) and Dennis Nettleton measure and record the gross weight of a field sample before it is analyzed in the lab.

specific soils analysis problems, NSSL is compiling a library of soils data. The laboratory performs detailed measurements on representative soils across the country. The laboratory's goal is to collect and store on a computer a complete array of data on at least 20 percent of the Nation's 12,000 soil series and selected data on the rest.

Another goal of the laboratory is to establish a national data bank to store NSSL data and data provided by the SCS Soil Mechanics Laboratory (SML) at Lincoln and other laboratories. The data bank will be available to anyone studying soils.

Some of the soils data that will be collected include: salinity, sodium-calcium ratio; potential for retaining nutrients; amounts of nitrogen, organic carbon, and iron; water retention; density; shrink-swell capacity; acidity and alkalinity; and texture. The SML will contribute results of engineering tests.

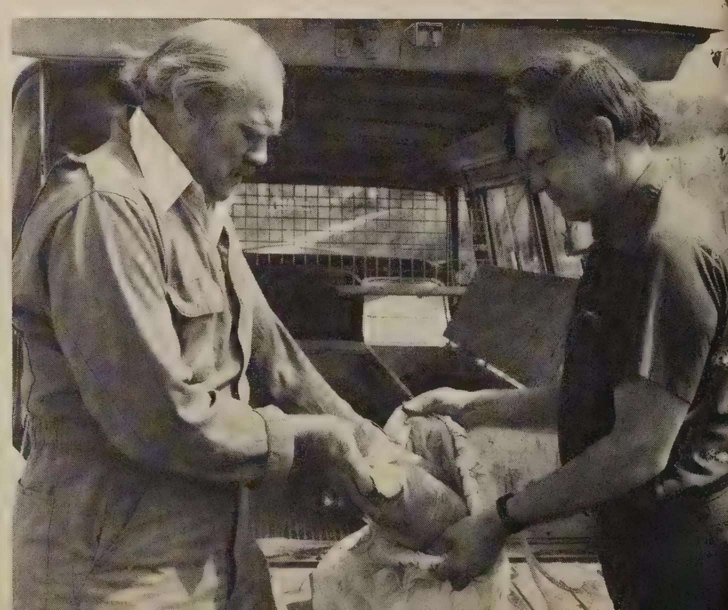
NSSL and SML scientists often combine their efforts. For example, they work together to identify unstable or dispersive soil materials at potential dam sites. SML developed a technique for testing such dispersive soils and NSSL provided staff assistance and data. The two laboratories provide combined physical and chemical measurements on materials from sites with possible dispersion problems. In turn, SML helps the soil survey program by running engineering tests on samples submitted to NSSL.

Data are sometimes required when soil survey and water quality concerns merge. In one instance, NSSL provided information about the mineralogy of sediments from the Columbia River near Portland, Oreg., that helped identify the upstream sources of those sediments.

Cooperative studies of regional problems sometimes involve several institutions. Increased mining activities in the Northern Plains give new impetus to questions about how much moisture can be stored and supplied by various kinds of soft rock materials. Montana State University is studying this problem with assistance from SCS. NSSL is providing data to help interpret the results. SCS has collected some related data in North Dakota in a combined effort by SCS personnel from North Dakota and NSSL and staff from North Dakota State University. Similar efforts are planned in other States where moisture storage and transmission properties of highly weathered rocks influence water movement and the moisture supplied to plant roots.

SCS depends heavily on research by other agencies. NSSL scientists are responsible for using the research of others and extending the applications of the results. This extension is made possible by a collection of standard data that allows one soil to be compared with another. By

At right, Soil Scientist Nettleton screens a soil sample to remove stones. Far right, the soil scientists bag the labeled soil sample which scientists at the soil survey laboratory will analyze for salinity, organic content, texture, and other characteristics.

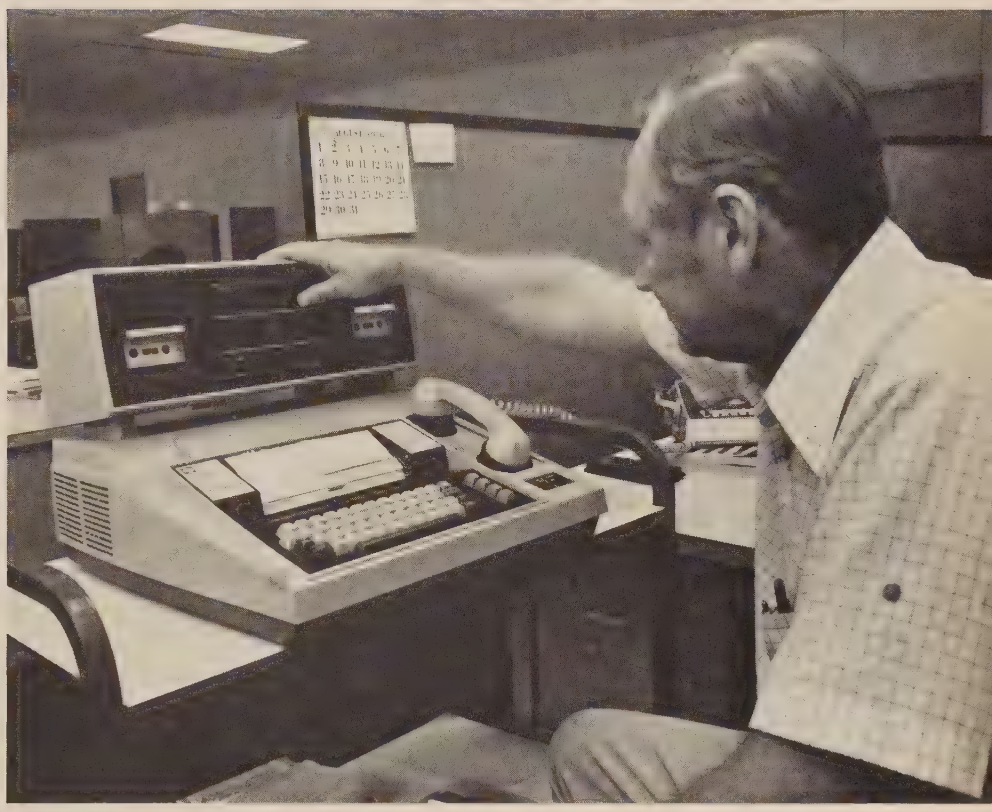


The laboratory's goal is to collect and store on a computer a complete array of data on at least 20 percent of the Nation's 12,000 soil series and selected data on the rest.

carefully selecting key properties of the most critical values, it is possible to develop a library of information from which more and more complex and precise predictions can be made. By following research results of other agencies, more and more uses can be made of the standard data.

Every day, cartloads of 10-pound bags of soil arrive at the NSSL. They are parceled out to scientists armed with microscopes, spectrometers, titrators, chromatographs, and other equipment. They yield their secrets to the scientists who are looking for better ways to predict the soils' performance in order to help resource planners better protect and use the soils.

Mr. Cross was head, information staff, Midwest Technical Service Center, SCS, Lincoln, Nebr., and is now retired.



Above, NSSL Soil Scientist Benny Brasher transmits soils data to the University of Nebraska for processing. At left, Fern Adams, physical science technician, loads automatic samples changer for atomic absorption apparatus.

Rio Grande Delta: A Soils Sampler

In the Lower Rio Grande Valley in Texas, the information in SCS soil surveys helps in managing the valley's varied soils and their many uses.

by Harold W. Hyde

The subtropical climate and long growing season in the Lower Rio Grande Valley help make it one of the leading areas of agricultural production in the Nation. On the fertile, level soils farmers produce cotton, citrus fruits, vegetables, and other crops.

The soils of the Lower Rio Grande Valley of Texas are the offspring of two unpredictable parents—the Rio Grande River and the Gulf of Mexico.

Enroute to the Atlantic Ocean from the Rocky Mountains, the churning, turbulent Rio Grande River has carved out canyons and gorges as deep as 1,700 feet through solid rock. As the river merges with the sea, it deposits material in the Lower Rio Grande Valley, forming a delta that covers 3,000 square miles. As a result, soils in the valley range from heavy clays to deep sands, and in places, sediments are several hundred feet thick.

Southeast winds blow inland daily from the gulf influencing the climate and vegetation. The winds affect soil development by depositing sediment through tide and wave action.

A large sand sheet formation on the northern boundary of the Rio Grande Valley is made of sandy soils

At right, periodic flooding is a problem for farmers in the valley. These workers are taking cabbages from the field with a helicopter because the soil is too wet to support harvesting machinery. Far right, besides making it difficult to carry on routine farm work, flooding caused by hurricanes accelerates erosion and silting.

that extend inland from the coast for 80 to 100 miles northwest. The origin of the sands has not been fully determined, but they may have been carried from the shoreline by the gulf winds.

In the Lower Rio Grande Valley, the soils, the river, and the sea present several problems for conservationists: the threat of periodic floods, poor drainage, salinity, and threats of winter freezes or summer hurricanes. Many of the problems are associated with the level terrain that is only a few feet above sea level and the erratic weather in which droughts may be followed by heavy rains.

The torrential rains that accompany hurricanes cause extensive flooding and result in silting, accelerated erosion, and sandbar formation along the shorelines and river flood plains. Flooding and property damage may occur inland for several miles. A single hurricane can change weather patterns for hundreds of miles inland.

Three Texas counties—Cameron, Willacy, and Hidalgo—make up most of the lower part of the Rio Grande Valley. Hidalgo, the largest county, is almost 1 million acres in size. Willacy County is so flat that it is said to be the only county in the United States that does not have a named stream in its boundaries.

The area is served by three active conservation districts. The Southmost Soil and Water Conservation District (SWCD) serves Cameron County. The other two are the Willacy SWCD and the Hidalgo SWCD.

Soil Conservation Service soil scientists are currently making soil surveys of Willacy and Hidalgo Counties. SCS released a published soil survey of Cameron County in May 1977.

Soils information is badly needed in the valley. One reason is the intensity of farming in the area. The Lower Rio Grande Valley of Texas is one of the Nation's leading agricultural areas. Another reason is that this is one of the fastest growing areas in Texas. Urban expansion is rapidly covering the fringe area around the major cities and towns. The complexity of soils and the urban flood hazards increase the need for soil surveys.

The Rio Grande is a source of another problem affecting conservation practices. The river and its tributaries carry toxic salts from the arid regions of the Southwest and Mexico. In earlier years, irrigation with this water deposited excessive salts on fields and orchards. But in recent years, dams have been constructed in Northern Mexico to divert some of the saline tributaries.

The nearly level topography, low elevation, and lack of drainage outlets make removal of the salts difficult. High water tables add to the problem. The installation of under-

At left, violent hurricanes originating in the Gulf of Mexico cause extensive flooding in the valley about every 10 to 20 years. Shown is flooding from Hurricane Beulah in 1967. During other times, irrigating suitable areas with water from the Rio Grande River (at right) helps make the valley highly productive.

ground tile drainage lines has helped remove part of the excess water and toxic salts. Soil surveys are used to determine the spacing of drainage lines. Soil survey maps help in locating clayey soils in the valley that are not permeable enough for drainage lines to be installed.

In an area of extensive row and flood irrigation, fields and orchards must be almost level. Soil survey maps are also used to determine which soils are suitable for leveling.

Most of the irrigated land in the valley is concentrated within 60 to 70 miles of the river and the ocean. The soils on the boundaries of the irrigated area are used for dryland crops and rangeland. In places, the rangeland has large amounts of desert-type shrubs, brush, and trees. Some of this acreage is now being cleared and seeded to pasture grasses. Other cleared areas are being converted to cropland. Soil survey maps are used to help determine the feasibility of land use changes.

Uses of the soils in the valley are as varied as the soils themselves. Unlike any other part of Texas, palm trees dot the flat horizon where they grow among citrus orchards and truck farms. Where irrigation water is plentiful and soils are productive, farming is intensive and highly specialized. Areas in the valley where the water runs short are used for productive rangeland. In addition, there are several wildlife refuges, State parks, and beaches crowded with tourists. Wildlife includes deer, coyotes, and Texas-sized rattlesnakes. White-winged dove attract hunters from several States.

Farmers began irrigating cropland in the valley in the 1890's using water from the Rio Grande. Cotton and vegetables, some of the first irrigated crops, are still important crops in the area. Citrus trees were introduced in the early 1900's. Production of citrus, mostly grapefruit and oranges, is about 18 million boxes each year. Sugar cane, grain sorghum, and seed corn are also prominent crops.

The climate, the ocean, and recreation have made the valley a haven for tourists. During winter the area's population of 450,000 swells to almost 650,000.

The river and the sea have influenced not only soil development and conservation practices, but also the livelihood of local people, both in the past and present. Economic and agricultural development is also related to the climate, soils, and water resources.

Soil surveys help in managing the varied soils of the Rio Grande Valley. But the river and the sea will always affect those who live there.

Mr. Hyde is a soil scientist, SCS, Edinburg, Tex.

Far left, soil survey maps help farmers and ranchers avoid areas of excess salinity like this in selecting new sites for pastures and crops. Left, most citrus orchards in the valley are flood irrigated with water pumped out of the Rio Grande River and into concrete-lined channels.

Soil Survey Wins Popularity Contest

by Roger Howell

A strong information campaign turned a soil survey into a "best seller."

Above, Don Pennington (left), senior planner of the Washtenaw County Metropolitan Planning Commission, and SCS District Conservationist Clark Eacker discuss a soil classification factor map. The commission has made several different factor maps, using the Washtenaw County Soil Survey, to help in countywide land use planning and in helping township planning commissions. Below, the soil survey also provides information the county planning commission can use in protecting prime farmland from urban sprawl.

Fourteen years ago, urban development was increasing and land uses were changing in Washtenaw County in southeastern Michigan. Urban and industrial development were eating up prime farmland. Developers and landowners needed guidance to avoid costly land use mistakes.

Today, the Washtenaw County Soil Survey is helping developers evaluate building sites based on soil characteristics. Developers are using the soil survey information to choose sites for houses where septic tank filter fields will function properly and basements will be dry. In addition, prime farmland is being saved from development.

The Washtenaw County Soil Survey is a standout as one of the most popular of Michigan's soil surveys. In just 6 weeks after the survey's availability was announced at a first issue ceremony in August 1977, SCS filled requests for 1,500 copies.

The survey was a joint effort of the Soil Conservation Service, the Washtenaw County Board of Commissioners, and the Michigan Agricultural Experiment Station. Those involved in the survey work agree that the need for the survey, the widespread use of interim reports before the survey was completed, and a strong publicity campaign made the Washtenaw County Soil Survey a "best seller" in the community.

"No one would be using the survey if they didn't know about it," said Clark Eacker, SCS district conservationist in Washtenaw County. "I firmly believe the key to interest in the soil survey is the continuous public exposure it received. We maintained a strong soil survey information program ever since the first auger full of soil was examined in 1968. Actually, distribution now is the easy part because people know about the survey and they want it."

"I remember a case where a house was built on a hillside in the summer and the next spring the owner couldn't keep the basement dry with two pumps."

"The soil survey was well publicized and we included it in the Washtenaw County Soil Conservation District's (SCD) education program," said William Fishbeck, chairman of the Washtenaw County SCD board. "The district had soil displays at all the county fairs and we kept people informed about the soil survey in the district's newsletter. We sponsored a special meeting for interim soil survey users and are planning to hold another series of user meetings.

"We were opportunists," Fishbeck continued. "We took advantage of all kinds of situations to tell people about the soil survey, its value, and uses. Eacker made guest appearances on radio and television programs and spoke at service club meetings.

"The district also encouraged assistance from others in spreading the news about the survey. The Metropolitan Planning Commission was a big help. They had several displays and made a slide program on soils to help promote the soil survey. County newspapers helped too. All they needed was Eacker to call them up with an idea.

"We had a continuous flow of news stories on the soil survey from start to finish," Fishbeck said.

"Soil surveys can be overwhelming the first time a person looks at one," said Eacker. "When I tell people how to use a soil map, I compare it to a jigsaw puzzle. With this method I can quickly explain how to use the soil map in a way people can easily understand."

"The County Public Health Department was the strongest user of the early soil maps," said Neil Stroesenreuther, assistant State soil scientist in East Lansing and soil survey party leader for the Washtenaw County Soil Survey from 1968 to 1973.

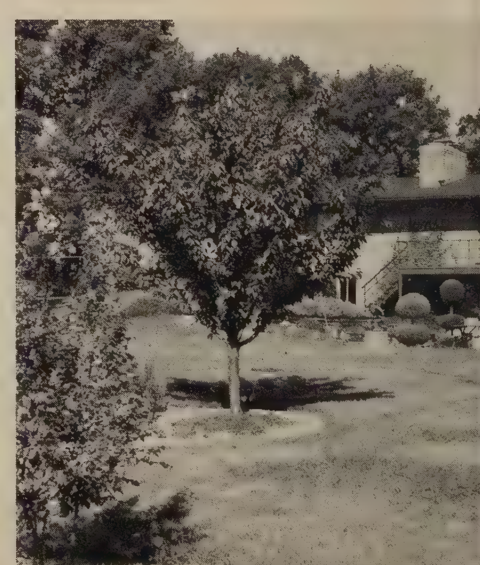
"I was called on at least three or four times a week to help the department identify and evaluate soils with questionable permeability for septic tank filter fields."

Stroesenreuther also helped train County Public Health Department sanitarians in using soil maps to make preliminary evaluations of sites for septic tank filter fields. He briefed them on soil descriptions and the soil survey and took them to the field so they could see how the soil scientists make soil investigations and the soil maps. He showed them how to identify different soils and what characteristics to look for in evaluating them for septic tank filter fields.

"Now we always use the soil maps to make preliminary evaluations of sites for septic tank filter fields," said Public Health Engineer Barry Johnson. "The soil maps tell us how extensive site investigations need to be and what we might expect.

"I remember a case where a house was built on a hillside in the summer and the next spring the owner

At right, "It's not a swimming pool" read an Ann Arbor newspaper caption for a photo of this basement excavation. Washtenaw County residents want copies of the soil survey to avoid problems like this. Far right, soils information helps developers and others select suitable sites for new homes, especially when onsite waste disposal is needed.



couldn't keep the basement dry with two pumps," Johnson said.

"The developer wanted to build six more houses in the same area. But, based on the information in the soil survey and our own investigations, we opposed it. The developer finally agreed to install an observation tube where we could watch the water level for a year before making a final decision. The next spring, water started coming up in the tube. It finally came to within a foot of the surface and the developer was convinced. He changed the grading and ditching plans to allow for proper drainage and we approved the new plans.

"Six new houses were saved from water problems," Johnson concluded.

As the SCS soil scientists and soil scientists from the Michigan Agricultural Experiment Station completed the field work for the survey, radio, television, and newspapers reported their progress and findings.

"It's not every day that a city gets something named after it, even if it is dirt," read a lead for an Associated Press news article. The article told about a new soil the scientists discovered and named Ypsi sandy loam after Ypsilanti, Mich.

Many of the news stories focused on specific soil problems and how soil surveys can help in making wise land use decisions.

The Washtenaw County Planning Commission used the soil survey information in making maps that show interpretations of the survey data, for example, the yield potential on different soils for corn.

The commission also used the information in drawing up a proposed long-range land use plan for the county.

Until the completed soil survey report became available in August 1977, interim soil survey reports were widely used.

The popularity of the Washtenaw County Soil Survey was sparked by: a need for an up-to-date inventory of the soils; use of interim soils reports; land use changes; a desire to preserve prime farmland; and a good information program that kept people aware of the soil survey, its value, and uses.

"People are using the soil survey because our information program made them aware of it," Eacker said. "I don't think use of the Washtenaw County Soil Survey or our soils information program have crested yet. I don't think they ever will. We will always find new uses for the soil survey."

Mr. Howell is public information officer, SCS, East Lansing, Mich.

SCS District Conservationist Clark Eacker uses his jigsaw puzzle method to explain the use of soil surveys to Maria Ittner, a student at the University of Michigan. Ittner needs the soils information for a forestry class.

High and Dry, Thanks to Soil Survey

by Charles L. Hammond

Using soil surveys before planning construction of their new courthouse saved Nebraska county commissioners from future trouble with flooding.

A beautiful new Madison County, Nebr., courthouse is sitting high and dry because the information provided by a detailed soils map was used at the right time.

In 1975, when Madison County was planning to build a new courthouse, Paul Terry, chairman of the county commissioners, went to the Soil Conservation Service to request that a detailed map of the soils be made on the proposed site of the courthouse.

"A site had been selected for the new courthouse because of proper zoning and its proximity to a central sewer system," said Terry, "but the elevation was a little low. I had heard about soil surveys and thought we should have one to avoid any trouble in the future."

Interpretations in soil surveys tell which soils are suitable for supporting a building and which soils require special treatment in preparation for construction and grading. The county commissioners wanted the soil survey information before they planned construction of the courthouse.

Soil scientists dug several holes at the proposed site and examined the soil for permeability, topsoil thickness, depth to bedrock, variance of the water table, soil texture, and drainage.

From their analyses, the soil scientists determined that the dominant soil type was Gibbon silty clay loam. The soil was deep, nearly level, and somewhat poorly drained, on occasionally flooded bottom lands. The water table fluctuated from a depth of 2 feet in wet years to below 6 feet in dry years.

The soil scientists reported to the county commissioners that the main hazards to development on this soil would be occasional flooding and wetness. On the basis of this information, a suitable fill of 4 to 6 feet was used to raise the site above the water table and flood plain and the courthouse was built without a basement.

The soil survey conducted at the courthouse site is part of an ongoing survey of Madison County sponsored by the Madison County commissioners and the Lower Elkhorn Natural Resources District. SCS soil scientists are working with soil scientists from the University of Nebraska-Lincoln to complete the mapping for the survey by September 1979.

Mr. Hammond is a soil scientist, SCS, Norfolk, Nebr.

The county commissioners for Madison County, Nebr., used soils information to determine what site preparation was needed before construction began on the county's new courthouse.

Conservation Up. . . Profits Up

Through improved soil water management, a farm family in Vermont has raised their profits and lowered their operating costs.

by Ann H. Dudas

A cooperator with the Winooski Natural Resources Conservation District for the last 26 years, Verne Bissonette has overcome many obstacles in managing his farm through conservation planning.

Conservation planning has helped Bissonette increase his farm's yield of corn silage by 50 percent in tons per acre.

To reduce costs and increase profits is the goal of every wise business person. Farmers are no exception. They too strive to get ahead, yet fluctuating markets and increasing energy costs sometimes make it difficult for them to break even, let alone realize a profit.

But some farmers are managing well despite the obstacles. In Vermont, Verne J. Bissonette in Chittenden County is one of them.

"We've been cooperators with the Winooski Natural Resources Conservation District since 1952, and for the past 26 years we've followed conservation plans we developed with help from the Soil Conservation Service," said Bissonette.

Verne and his son Wayne operate in partnership a farm that has been in the family for almost 60 years. It was originally purchased in 1919 by Verne's father Joseph, who transferred ownership to Verne and his wife Daisy in 1946. Over the years, several neighboring farms were incorporated into what now makes up the Bissonette farm. There are 620 operating acres; the Bissonettes use 495 acres and rent the rest.

They have 182 acres in pasture, 148 acres in cropland and hayland, 158 acres in woodland, and 7 acres in depressions along streams in wildlife land. Out of their herd of 233 cattle, 137 are milkers which produce more than 1.5 million pounds of milk a year.

Today, four generations of Bissonettes, from Joseph on down to his great grandchildren, live on the farm. While Verne and Wayne tend to the manual labor, Daisy maintains the books with the air of an accountant.

"I was off 3 cents last year and that really bothered me. I looked everywhere, but I couldn't find it. This year I wasn't off even a penny," she said.

While Daisy might have "lost" 3 cents balancing her books, the profits she is able to show more than make up for it. In the past 2 years, the farm's yield has increased 50 percent in tons per acre of corn silage as a result of practicing conservation.

Before they installed their soil water management system, the Bissonettes had problems with excessive wetness on their cropland and hayland because of the seasonal high water table and poorly drained soils. They needed to lower the water at the surface 6 to 12 inches to enable plant roots to develop properly. They were also having problems with their heavy farm equipment getting stuck in the mud.

To control the soil saturation, SCS helped the Bissonettes design surface ditches, subsurface drains, and grassed waterways to remove excess water from their cropland and hayland.

Under the Agricultural Conservation Program, the Agricultural Stabilization and Conservation Service provided the Bissonettes 50 percent cost sharing on the ditches and waterways.

The surface ditches are 2 to 3 feet deep. The bottoms of the ditches are lined with stone to prevent scouring and the banks are seeded with Kentucky 31 fescue, timothy, and clover. Red fescue, redtop, and reed canarygrass are planted close to the water line.

In areas of heavy silt, the Bissonettes installed subsurface drains. They dug trenches 2½ to 3 feet deep; backfilled them with a layer of gravel; laid flexible, corrugated plastic tubing; and then covered the tubing with about 1½ feet more of gravel. The subsurface drains carry water to stone headwalls and the water is directed to existing watercourses.

Grassed waterways also safely carry runoff from fields to suitable outlets. Some grassed waterways are used as outlets for surface ditches.

A severe drought in the summer of 1977, followed by a record rainfall in the autumn, raised havoc with the crops on neighboring farms. Corn growth was stunted and what survived ended up rotting in the fields from excessive moisture. However, the Bissonettes were able to salvage nearly 70 percent of their normal corn silage because the ditches and grassed waterways carried the excess moisture off the fields.

The installation of surface and subsurface drains also made it easier to run machinery on the poorly drained soils and enabled the Bissonettes to reduce their operating expenses by 25 percent.

As conservation-minded farmers, the Bissonettes also rotate grazing on their pastures to prevent overgrazing, improve grass production, and minimize erosion. On their cropland and hayland they use a 4-year rotation of 1 year of corn or

Drought, followed by a record rainfall, raised havoc with corn crops on neighboring farms, but the Bissonettes salvaged 70 percent of their normal corn silage because of their conservation measures.

The Bissonettes plan to continue in their conservation efforts which have helped them protect the soil and increase their farm's production.

oats followed by 3 years of forage crops. The forage crops include 'Pennscot' red clover, timothy, 'Viking' trefoil, and alsike clover. In fields with high pH, they grow saranac alfalfa.

As part of timber stand improvement on their woodland acres, SCS helps the Bissonettes use soils information to determine which trees are most suited to the soils and climate.

Besides gaining financially, the Bissonettes discovered that conservation planning also adds to their family fun. Referring to a pond designed and installed according to their conservation plan, Daisy said, "We really enjoyed 'just getting away' for picnics up there. We've even stocked it and the kids have a grand time fishing in it."

The wildlife land that the Bissonettes preserved along streams attracts muskrats, beavers, woodchucks, mallards, wood ducks, and teals.

Always looking toward the future, the Bissonettes have an idea for making their farm even more profitable. Realizing the potential of nutrients in animal waste, they hope to build an agricultural waste facility. That way they can store manure from their feedlot through the winter months and plow it under in the spring without losing much of its fertilizer value. Because bedrock is so close to the soil surface, their storage facility will have to be above ground.

"With a waste facility," Verne explained, "we'll save money because we won't have to start that big tractor every day to spread the waste."

Another money-saving plan is to convert some of their cornland to hayland. The Bissonettes know that on some of their land, hay will produce acre for acre more digestible protein for their herd.

In 1977, the Winooski Natural Resources Conservation District chose the Bissonettes to receive the Conservation Farmer of the Year award for Chittenden County.

When asked what he thought of the conservation program for his farm, Bissonette replied, "You need one because there aren't any two farms that can be farmed the same way."

Daisy summed it up when she added, "Over the years, we've met a lot of really nice people and we've had a lot of help."

Ms. Dudas is editorial assistant, SCS, Burlington, Vt.

In the Colorado mountains, wagon wheel ruts eroded into deep gullies. Critical area treatment finally put a stop to the 100-year-old erosion.

by Joseph J. Alessi

Pulling the Reins on Mountain Gullies

Erosion increased rapidly in Custer County in south-central Colorado when the first settlers moved into the fragile mountain environment in the 1870's. In order to bring supplies into the area, wagons moved up the valleys cutting deep ruts with their heavy loads. When one road became impassable, the wagoners moved over until several ruts were worn into the ground.

In this area, summer is the season of high-intensity thunderstorms. The rain falls on the watershed, races down steep inclines, cuts away the topsoil, and deposits it as sediment downstream. Gradually through the years, erosion has turned the wagon ruts into deep gullies and arroyos.

The subwatershed above Tyndall Gulch, which lies 2 miles northwest of Rosita in Custer County, is a combination of private and Federal lands. The Federal land is administered by the U.S. Department of the Interior's Bureau of Land Management (BLM).

BLM and Custer County wanted to control erosion in the area and prevent sediment from being carried into Grape Creek, the Arkansas River, and eventually from filling the sediment pool of the new Pueblo reservoir and dam. In 1973, they requested assistance on an erosion control project from the Soil Conservation Service through the Custer County-Divide Soil Conservation District. The project was authorized for assistance under the Sangre de Cristo Resource Conservation and Development (RC&D) Area.

SCS engineers submitted surveys, designs, and cost estimates for various solutions to the erosion problem. BLM and Custer County selected the alternative they wanted, deciding to start the critical area treatment at the crest of the hill where water spilled down from a 95-acre subwatershed.

Erosion had created four gullies in Tyndall Gulch's channel. The main channel was 20 feet deep and the side gullies were 10 feet deep. At the beginning of the project, all the gullies were cored out and backfilled with compacted earth. Shaping and seeding was done along a half-mile stretch downhill.

Seven level terraces were constructed to hold floodwater and let it seep slowly into the soil. The terraces range from 720 to 1,223 feet long. They are from 1½ to 4 feet high, each about 30 vertical feet apart.

About halfway down the hill, a 20-foot-high dam was constructed to slow runoff water. When the dam is filled with water, two ditches carry the overflow onto a seeded area below at nonerosive velocities. On the downhill side of three road culverts, the county installed and paid for three concrete culvert spilling basins.

Twenty acres were seeded to adapted grasses in a mixture of milkvetch, crested wheatgrass, slender wheatgrass, and bromegrass. To protect the exposed site from livestock, 5,676 feet of fencing was constructed.

SCS Project Engineer Bill Snyder and Construction Inspector Gilbert Mondragon encouraged the contractor to leave trees or vegetation where possible to accelerate the healing of the area.

On the private land, Custer County paid 20 percent of the construction costs and RC&D funds covered the remaining 80 percent. BLM paid all the construction costs on its land. RC&D paid the costs for technical services and project administration not included in the project's contract.

The critically eroding area is now well on the way to recovery, reducing the damage to the site and the downstream areas.

Mr. Alessi is RC&D coordinator, SCS, Pueblo, Colo.

Far left, old wagon roads used by settlers in the Wet Valley Mountain area in Colorado in the 1870's had eroded into deep gullies. Near left, through critical area treatment, the historic scars are healing well, reducing erosion and sedimentation.

Family Style Conservation

by Ernest A. Busek

From sand dunes in their wheat fields, a Montana family has built a conservation showpiece on their Great Plains ranch.

Back in the early 1950's, the Mothershead family had a goal: to install conservation practices on their 3,200-acre ranch in eastern Montana. They also faced a challenge because the sandy wheatland suffered from severe wind erosion.

"Did this land blow? You bet it did," said Bob Mothershead. "In one field, we had to use a blade to level the sand dunes so we could plant trees for a windbreak."

The family planted 14,000 trees—Siberian elm and Russian-olive—in rows through the field and around the farmstead. The trees plus a good stubble mulch protect the soil from the Montana prairie winds. Today the dunes are gone.

A white-tailed deer ghosts into the cover of the trees, disturbed by human visitors. Sharptail grouse, songbirds, and other wildlife also are attracted to the tree-covered area.

The trees are impressive, but the Mothershead family has installed other conservation practices on their beef cattle and small grain operation in McCone County.

Wind stripcropping—alternate strips of wheat and fallow—protect other fields. The Mothersheads also keep crop residue on the surface of fallow strips to further protect the soil from blowing.

On sloping fields, the family uses contour strips to lessen the chance of water erosion. They also established grass buffer strips on these fields. They graze the grass buffers or cut them for hay.

On an intermittent stream that winds through the ranch, the Mothersheads built a dam to store runoff water that is normally lost in this low rainfall area. Pumped into a system of dikes, the water irrigates 80 acres of hayland.

The family built stockwater developments on the rangeland to distribute the Hereford cow-calf herd for better conservation of the native grasses, which also provides higher quality grazing.

This conservation showpiece took a lot of hard work and planning. After the Mothershead family purchased the ranch in 1950, they became cooperators with the McCone County Conservation District (CD). Later, working through the district, they signed a Great Plains Conservation Program (GPCP) contract with the Soil Conservation Service. Under the GPCP, SCS provides technical assistance and cost sharing for specified conservation practices.

"The Great Plains Conservation Program was certainly a big help for us in getting the things done that we wanted to do," said Bob. The Mothersheads completed their Great Plains contract in 1966 and still work to maintain the conservation practices they installed.

Even though the Mothersheads have completed their GPCP contract, their conservation story continues. In 1964, they leased another ranch with more than 1,200 acres of deeded land and nearly 9,000 acres of grazing land owned by the Bureau of Land Management, the State of Montana, and the Burlington Northern Railroad.

After they purchased the deeded land, they worked with SCS personnel to develop a conservation plan. In 1977 under the plan, they constructed a stockwater dam and developed two springs to complement the other water developments and grass seedings previously carried out.

Randy Mothershead working at the site of a stockwater dam he and his family built on their ranch in Montana.

In 1965, shortly before the Mothershead family completed their GPCP contract, the McCone County CD presented them with the Conservation Farmer of the Year award.

The Mothersheads are proud of the conservation work they have accomplished through the years. "It's only natural," explained Bob, "for a family that believes land must be cared for so that it can be used for future generations."

Mr. Busek was district conservationist, SCS, Circle, Mont., and is now district conservationist at Hamilton, Mont.

Managing Crop Residues

by Bethel C. DuRant

Leaving residues in grain fields protects the soil from erosion and provides food for wildlife.

"If you really want to cut down on soil erosion in your grain fields, just leave the harvest residue on the land in the fall," said Gordon Wells, a Jasper County, S.C., farmer.

Wells knows from experience that properly managed residue makes sense in more ways than one. He says that leaving the land covered in winter rather than burning it or disking it immediately after harvest helps cushion the explosive effect of falling raindrops and makes more water soak into the soil.

He also says that he improves his surface layer and prevents extreme changes in soil temperature by leaving the residue.

"I usually bush hog the corn stubble to make it rot quicker. This also shreds the weeds and grasses that have come up after the herbicide has lost its effectiveness.

"People don't realize that erosion is a problem on our flat land down here," Wells explained, "but the truth is, we have very little acreage around here that won't erode in a heavy shower or blow in the spring when it's bare."

Wells, who serves as a commissioner of the Jasper Soil and Water Conservation District, is quick to point to additional values of crop residues.

"I'm an outdoorsman," he said, "and the wasted grain provides ideal food for wildlife." He goes a step further in encouraging wildlife by leaving narrow, unharvested strips of corn or beans around the field edges to provide food and cover for deer, quail, and doves.

When asked about increasing disease and pest problems as a result of leaving the residue in his corn and beans, Wells says he hasn't had any. However, he watches closely for these problems and realizes that he might have to use some other methods, such as a winter cover crop or rowbedding on the contour, to save his soil.

Mr. DuRant is district conservationist, SCS, Ridgeland, S.C.

Gordon Wells (left), a district commissioner in Jasper County, S.C., leaves crop residue on his fields in the fall to protect the soil from erosion through the winter. He discusses the benefits of residue management with SCS District Conservationist Bethel DuRant.

Burying Your Home to Save Energy? Better Check the Soil First

Burying homes in hillsides or placing them underground may save energy, but you'd better check the soil first, according to a Soil Conservation Service soil scientist.

"Floods pose the biggest hazard," said David F. Slusher, SCS soil scientist. "In a conventional home, a flash flood may be an inconvenience; in an underground dwelling, it's a disaster.

"Sliding soils are a close second as a hazard. Even a small landslide could cover up your front door and air supply."

Soils that may flood or slide are described in SCS soil surveys, which are available from local SCS offices.

"Soil surveys also help homebuilders spot other buried-home hazards, such as high water tables, high acid or sulfate soils that corrode concrete, and soils that shrink or swell. But surveys can be used for more than trouble shooting. They can help prospective builders find sites with soils and slopes suitable for buried homes."

Slusher says that homebuilders should consider in advance where to put waste disposal facilities.

"If you have to use a septic system, you want a lot with a level stretch of land downhill from the home for the septic fields," he said. "Otherwise, you have to pump the sewage uphill and that would use some of the energy you're trying to save."

Another consideration, according to the soil scientist, is growing grass and other plants over the house. While this practice helps control soil erosion, improves the land's appearance, and saves energy, it can also be a problem.

"You would need at least 2 feet of good loamy soil over your house to support a lawn," Slusher advised. "That means having an engineer make sure that your roof will support that weight of soil.

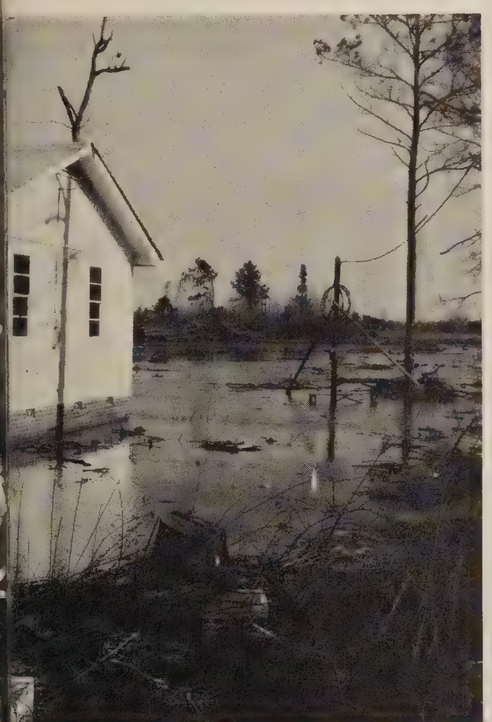
"If I were going to build a buried home, I'd begin with an SCS soil survey to get a general idea of soil

At left, this buried home in West Virginia wasn't planned that way. The landslide covering the home isn't a mine spill, but soil from an undisturbed 40 percent slope. An underground home in this type of soil might vanish without a surface clue to its location. At right, frequent floods may help control anthills around this South Carolina house, but a buried home in such soil would probably suffer the same fate as the anthills.

limitations and potentials. Then I would dig a hole at the site as deep as I'm planning to build and see what's down there. I might hit bedrock after 8 feet; there could be water down there.

"Whatever the circumstances are, I'd want to know about them before I spent a dime of construction money."

The scientist's interest in buried homes was sparked by stories in several newspapers and magazines, which referred to underground private homes and office buildings, and even plans for a penitentiary buried in a hillside.



Meetings:

October

1–6	Water Pollution Control Federation, Anaheim, Calif.
6–10	American Horticultural Society Congress, Nashville, Tenn.
8–10	American Forestry Association, Hot Springs, Ark.
11–13	American Water Works Association, Chesapeake Section, Norfolk, Va.
14–17	Farm and Industrial Equipment Convention, Boca Raton, Fla.
14–18	Congress for Recreation and Parks, Miami Beach, Fla.
16–20	American Society of Civil Engineers, Chicago, Ill.
17–20	National Conference of Editorial Writers, Detroit, Mich.
21–25	American Bankers Association, Honolulu, Hawaii
23–26	The Geological Society of America, Toronto, Ontario, Canada
25–27	Adult Education Association of the United States of America, Portland, Oreg.
26–29	National Association of Biology Teachers, Chicago, Ill.
29–Nov. 1	The Irrigation Association, Palm Springs, Calif.
29–Nov. 2	American Association of State Highway and Transportation Officials, Louisville, Ky.

November

7–10	Future Farmers of America, Kansas City, Mo.
10–13	National Agricultural Plastics Association, Miami Beach, Fla.
12–15	National Association of State Universities and Land Grant Colleges, St. Louis, Mo.
12–15	National Forest Products Association, Palm Beach, Fla.
12–16	American Institute of Chemical Engineers, Miami, Fla.
13–17	National Conference on Urban Forestry, Washington, D.C.
13–20	The National Grange, Denver, Colo.
19–22	American Society of Landscape Architects, Atlanta, Ga.
29	No-Tillage Systems Conference, Griffin, Ga.

December

3–6	American Society of Farm Managers and Rural Appraisers, Inc., New Orleans, La.
3–8	Joint Meeting of the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America, Chicago, Ill.
4–8	American Geophysical Union, San Francisco, Calif.
5–7	Western Forestry and Conservation Association, Sacramento, Calif.

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Soil Conservation

November 1978

U.S. Department of Agriculture

A Guide to Saving the Great Lakes

From the Administrator

This summer in Canada, the Great Lakes Pollution from Land Use Activities Reference Group (PLUARG) presented its final report to the International Joint Commission (IJC) (see page 23). Norman A. Berg, SCS Associate Administrator, was PLUARG's U.S. chairman and Murray G. Johnson of the Ontario Region Fisheries and Marine Service headed the team for Canada.

The report was the result of almost 6 years of work. The findings and recommendations were based on the most up-to-date and comprehensive assessment of the relationships between land use and water quality. Pilot watersheds throughout the Great Lakes Basin were carefully monitored in both the U.S. and Canadian river basins.

Water quality problems in the Great Lakes Basin are similar to water quality problems in many parts of the Nation. PLUARG gives us a guide to improving water quality in the most cost effective and acceptable manner. A few of the important findings are:

- The Great Lakes are being polluted, from some land uses, by runoff of phosphorus; sediments; and some industrial organic compounds, previously used pesticides, and heavy metals. Lakes Erie and Ontario are most affected.
- Most nonpoint source pollutants that reach the Great Lakes are attached to soil particles from sheet and rill erosion. About 80 percent of this pollution comes from less than 20 percent of the land.
- Most of the nonpoint pollution comes from cropland. However, it is not the land use itself that affects water quality, but rather how the land is managed.
- It will not be necessary to do "everything everywhere" to improve Great Lakes water quality. We can focus our technical assistance, education and information programs, and dollars on the most important "hydrologically active areas" or on key lands within those areas that contribute the most pollutants to the lakes. These are primarily row-cropped areas on fine-textured soils, near streams and rivers.

The framework within which SCS can assist in improving water quality in the Great Lakes is already in place. It includes soils information provided through the National Cooperative Soil Survey and other resource planning data; Section 208 planning and implementation, including cost sharing under the Rural Clean Water Program; conservation districts, which have demonstrated throughout the country their readiness to take on water quality leadership; and assistance available from other USDA agencies.

The PLUARG report is only a guide. After the IJC holds public hearings, it will make recommendations to the United States and Canadian Governments. Then, action by local, State, and both national governments—with strong public support—will be needed to reduce the amount of sediment and other pollutants that reach the Great Lakes in runoff. SCS can help in the effort by continuing and strengthening its assistance to landowners and land users in reducing nonpoint pollution.

Mel Davis

November 1978, Vol. 44, No. 4

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Soil Conservation

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Contents

Cover:
One of the reasons the National Wetland Inventory got its start was for the migratory bird wetland acquisition program. The inventory will have many other uses. See article beginning on page 17. (From a photo by Donald C. Schuhart.)

Nature Study on Top of Green Mountain

by George D. Fears
and Sammy K. Harris

A nature study center in Alabama has a lot to offer: a soils display, a geology exhibit, wildlife study areas, historic attractions, and 2 miles of trails.

What better place to have an outdoor classroom than in an area surrounded by nature? Even the benches and lectern are made of natural materials.

The nature center offers members of the Town and Country Garden Club an ideal setting in which to hold their business meetings.

On the Cumberland plateau where the Appalachian Mountains reach into northern Alabama, lies the 72-acre Green Mountain Nature Study Center. At the center, Madison County, Ala., residents and visitors can study plants and wildlife in their natural habitat.

"In 1970, a group of citizens asked the Madison County Commission for assistance in planning a park on top of Green Mountain," said James Record, commission chairman. "The commission members were enthusiastic about the idea. We knew that with local support we could develop a fine recreation and nature study facility.

"From the beginning, the project was a cooperative effort of the Madison County Commission, citizen groups, and government agencies. Thanks to many dedicated people, the nature center is now a reality."

The center is located in a forested area about 12 miles from Huntsville, more than 1,300 feet above sea level.

"The nature center is different from a park," explained Tony Wilmer, the center's administrator. "It has no facilities for overnight camping, cookouts, or organized sports. We specialize in providing the public, especially children, with an opportunity to learn about nature."

Visitors arriving at the center sign a register at the rustic Orientation Pavilion. Brochures, prepared by the Madison County Commission, are available in the pavilion to explain the trails, wildlife study areas, and other facilities.

Inside the pavilion, various agencies have nature study exhibits.

A display prepared by the Alabama Forestry Commission includes a tree leaf identification chart and a stump from an old oak tree with an explanation about how to determine the tree's age, its years of good and bad growth, and how the annual growth rings are formed.

The Madison County Soil and Water Conservation District (SWCD) gave the center a display of soils occurring in the county. SWCD and Soil Conservation Service personnel use the soils display when they give interpretive lectures about the soils and their uses.

Other exhibits in the pavilion include a geological profile showing how native sandstone, shale, and limestone were formed; pictures and identification charts of wildflowers and songbirds; and wood carvings of local birds.

One of the highlights of the nature study center is 2 miles of trails. SCS and the Alabama Forestry Commission assisted the Madison County Commission in laying out the trails and clearing underbrush. The trails were designed to follow the contour of the land as much as possible to prevent erosion. Wood chips cover the trails.

Study areas along the trails include specimens of Alabama's native plants. Trees such as oak, hickory, pine, eastern redcedar, and chittamwood are identified by their common and scientific names. Native wildflowers such as ladyslipper and bluebell are also identified.

Recently, a 1,500-foot Braille Trail was added to the nature center. The trail is equipped with rope hand guides and information markers written in braille.

Although the center is only a few miles from Redstone Arsenal, home of the Saturn V rocket that put men on the moon, visitors to the center can step back into the past as they visit an old-fashioned springhouse, an authentic whiskey still, a reconstructed log cabin, or a covered bridge. Plaques show the original locations of the structures and give the history of the areas where they had stood.

The center was developed around a 16-acre, manmade lake formed in a natural basin by an earthen dam designed to hold water from the area's springs. SCS provided technical assistance in selecting the location for the lake and in designing the dam. Although fishing isn't permitted, the lake is stocked by the Alabama Department of Conservation and Natural Resources with bass and bream.

There are two outdoor classrooms at the center, each having log benches and a wooden lectern. The outdoor classrooms are available to the public and some teachers from Madison County schools use them regularly. Biology teachers bring their classes to the center to augment classroom teaching. Students have the opportunity to identify wildlife and plant habitat and study how plant and animal life varies from the marsh area around the lake up to the mountain ridge.

Wildlife food plots and habitat have been established throughout the center. Some of the wildlife that inhabit the area are rabbits, squirrels, beavers, muskrats, opossums, and raccoons as well as many native birds—mockingbirds, robins, sparrows, chickadees, cardinals, and woodpeckers. Wood duck nesting boxes have been placed around the lake and an observation shelter is available for viewing wildlife in its natural environment.

The Green Mountain Nature Study Center is open from dawn to dusk, 7 days a week. It offers a variety of learning experiences in history, biology, geology, ecology, and nature appreciation.

Mr. Fears was a soil conservationist, SCS, Huntsville, Ala., and has resigned.

Mr. Harris is district conservationist, SCS, Huntsville, Ala.

Hand-planting was the order of the day in the early 1940's when pine trees were used to stop severe wind erosion.

In 1944, Hugh Hammond Bennett, first chief of SCS, inspected the erosion in western Michigan. His left hand shows the original soil level.

Yesterday's Trees, Today's Jobs

by Roger Howell

Trees planted 30 to 40 years ago to control wind erosion are providing people in Michigan with jobs and income today.

Work crews today thin the 40-year-old stands. Scattered clear cut areas are protected from wind erosion by the surrounding trees and will be replanted.

In the 1930's during the Nation's worst economic depression, farmers in Ottawa County, Mich., were struggling to earn a living and keep their soil in place. Severe wind erosion of the sandy soil along Lake Michigan was blowing fields and farms away. Drifting sand was burying roads and fences.

By 1938, programs were operating to solve the economic problems and erosion. Civilian Conservation Corps (CCC) camps were established throughout the Nation to provide jobs and stimulate the economy and the Soil Conservation Service had been established in 1935 to combat soil erosion.

In western Ottawa County, where wind erosion was the most severe, farmers took advantage of Michigan's new law that allowed local landowners to organize soil conservation districts. The West Ottawa Soil Conservation District (SCD) was the first district organized in Michigan. Through the new conservation district, SCS and the Grand Haven CCC camp helped farmers hold down their land.

But, for some, the West Ottawa SCD came too late. Because of delinquent taxes, the State had acquired 1,436 acres of land from farmers in the county. Some farmers had decided to try elsewhere and had sold their land to the only purchaser available, the Federal Government.

In 1940, ownership of the land acquired by the State was transferred to Ottawa County and the county leased it to the West Ottawa SCD. In 1942, the Federal Government

One tree can only do so much. Before the wind erosion of the 1930's, the ground line was even with the mound protected by the tree.

purchased 6,200 acrés in the county. The SCD annual report for that year described the tract as "blow areas devoid of vegetation and a menace to neighboring areas." In 1943, the newly purchased Federal land was also leased to the district for management.

The West Ottawa SCD led the way in showing area landowners what to do about wind erosion and how to do it. The SCD established its own tree nursery, planted trees on the land it leased, and organized tree planting bees. Besides the trees the district grew in its nursery, it received trees from the State and SCS for the project. SCS also provided technical assistance. The Grand Haven CCC camp provided the labor for the many tree plantings.

In 1941, local citizen volunteers planted 45,000 trees in 1 day on Dewey Hill, an area in the county badly needing protection from erosion.

Also, following the district's example, farmers established their own nursery beds to grow the trees they needed. In 1943, they produced over a million pine seedlings, and by 1948, 59 4–H clubs and several schools had nursery beds. Today, Ottawa County has about 36,000 acres planted to red, white, Scotch, and jack pine trees. Red pine is the dominant species, making up about 50 percent of the stands. Jack pine has done well on poor sites and some pitch pine is growing although it is not common to the area.

The efforts of the West Ottawa SCD paid off. The tree plantings significantly reduced wind erosion in the county. The district had also set the stage for a future employment program that would show people how to manage their mature tree plantations.

The Comprehensive Employment and Training Act (CETA) of 1973 provides work for people who need jobs and work experience. In late 1976, when the Ottawa SCD (formerly the West Ottawa SCD) leaders were asked if they knew of a project that could provide work and training for CETA employees, their reply was, "We sure do."

The district still held the lease on more than 1,200 acres of county-owned land, and the trees they had planted earlier to stop erosion were now too thick and needed management.

In March 1977, the SCD hired Veronica Sullivan, a forester, through the CETA program to plan and supervise a woodland management project. Sullivan consulted with CETA officials, SCS, a local paper company, and foresters from the Michigan Department of Natural Resources.

She determined management methods to fit the needs of different forest areas based on the soils, the kinds of trees, and their growth rate. Selective cutting was done in some areas and some areas were clear cut and are being replanted with red pine. The scattered clear-cut areas are protected from wind erosion by the surrounding trees.

By mid-April, 34 people were working on thinning the 35- to 40-year-old pine plantations. The project was expanded and in July, 93 people were working on the project. By November, they had harvested 2,100 cords of pulpwood in thinning operations on 175 acres. Wood from the thinning operation was sold to a paper company in nearby Muskegon, Mich.

The paper company now considers Ottawa County and the surrounding area an untapped pulpwood resource and offers free management assistance to insure sustained local wood production. Private timber cutters are providing jobs for people trained through the woodland management project and Sullivan now has a job with USDA's Forest Service.

At the beginning of August 1978, improved cutting had been done on 510 acres and 55 people are still working on the project. Of the district's former CETA employees, 200 now have unsubsidized jobs.

The project has met its goals of providing jobs and training to the unemployed. It also helped landowners, who had planted pine trees almost 40 years ago to control erosion, to see value in land they once considered useless.

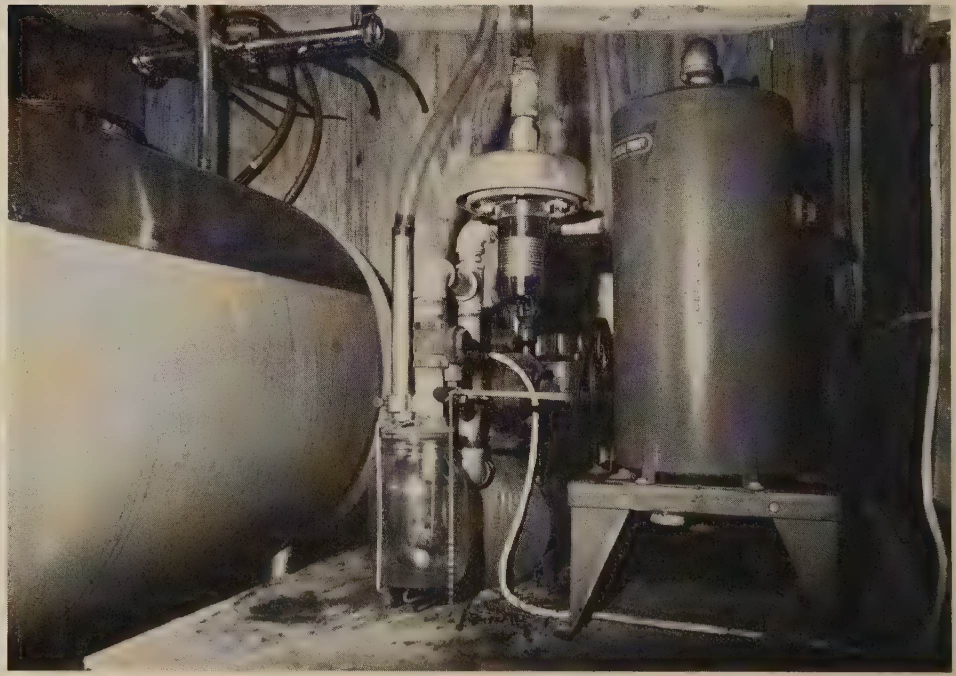
The woodland management project has shown that trees planted to control wind erosion also produce income when managed wisely.

Mr. Howell is public information officer, SCS, East Lansing, Mich.

Sugar Maples Milked as if They Were Cows

An innovative Virginia farmer discovers that milking machines are not just for cows.

Aerial lines of plastic tubing, strung from tree to tree, feed sap into a processing shed.



What used to work for cows works just as well for trees. A converted milking machine creates a 15-pound vacuum to keep the sap flowing.

by Helen S. Jeter

The Puffenbarger farm covers 84 acres in northwestern Highland County near Blue Grass, Va. The farm's primary enterprises are beef cattle and sheep. However, a 33-acre sugar maple orchard adds sweet income.

Maple syrup products offer many opportunities for expanding farm incomes, particularly for innovative operators willing to explore new techniques. Ivan Puffenbarger has done just that. He now milks his 850 sugar maple trees with an old milking machine.

Ivan Puffenbarger became a cooperator with the Mountain Soil and Water Conservation District in 1960. When Puffenbarger's conservation plan was developed, the Soil Conservation Service forester recommended that Puffenbarger thin the maple orchard. Since sap from the sugar maples has a much higher sugar content than sap from red maples, the forester advised him to remove the red maples and create more room for the sugar maples. This would allow the sugar maples to grow larger tops which provide more sugar water for more syrup resulting in increased income.

In 1964, Puffenbarger stopped collecting maple sap in buckets and installed plastic tubing to collect the sap and transport it to his processing shed. This method offers a neat solution to the problems of collecting sap from trees on the steep slopes of Highland County which are often covered with ice and snow.

Originally, the tubing installed on the Puffenbarger farm was laid on the ground. Today, it is carefully hung in an aerial system. The secret to the success of using tubing is for the sap to flow freely to a collection point. To assure free flow, Puffenbarger uses an old milking machine with a 15-pound vacuum that increases the sap's flow to three times the natural flow.

This was not the end of Puffenbarger's new techniques. He installed one of the first automatic, oil-fired evaporators in Virginia. Since he is interested in fuel conservation, he delights in describing the efficient operation of his automatic evaporator. It contains copper coils to carry off steam created by the boiling sugar water. The coils are so arranged that they contribute additional heat.

The longer sugar water boils, the sweeter and thicker it gets. "It takes an average of 2 hours of boiling sugar water in the evaporator before the first syrup can be drawn off," Puffenbarger explained. "But once it starts, you can draw off syrup every 5 minutes. The thickening of the colorless sugar water causes it to move through the evaporator until a gage indicates draw off time. The automatic operation of the evaporator prevents overcooking, wasted time, and wasted fuel."

Oldtimers in the maple sugar business say hard winters make better syrup. Puffenbarger is inclined to agree. The winter of 1976-77 was the most severe on record in Virginia for many years.

"It normally takes 40 gallons of sugar water to produce 1 gallon of maple syrup; but in the winter of 1976-77 only 30 gallons of sugar water were needed to make a gallon of maple syrup," said Leslie Moyers, soil conservation technician at Monterey.

"Even though the winter of 1977-78 had many days of extremely cold temperatures, it just ended too soon," he continued. "So last winter it took 40 to 45 gallons of sugar water to make a gallon of maple syrup."

The maple sugar season is short but very busy for the Puffenbarger family. Ivan oversees the boiling sap; his mother, wife, and daughter create maple sugar products in the kitchen; and his brother Roy handles sales.

As part of his woodland management plan, Ivan harvests trees too old to produce sugar water and sells them for lumber.

Ivan Puffenbarger is a dedicated district cooperator and works closely with personnel from SCS and the Extension Division of Virginia Polytechnic Institute and State University. Working together as a team, they have offered several 1-day training sessions for sugar maple farmers who are interested in seeing sugar maple trees milked like cows.

Ms. Jeter is public information officer, SCS, Richmond, Va.

Working on the Woods

by Jack Busfield
and Jerry N. Fox

Landowners in West Virginia let the sun shine in on their woodlands and grew jobs along with the trees.

One natural resource that there is no shortage of in central West Virginia is trees. Some counties are more than 90 percent forested. The Elk Soil Conservation District (SCD) recognized a need for timber stand improvement in the area and developed a program to help landowners in Braxton, Clay, Nicholas, and Webster Counties.

The timber stand improvement (TSI) program involved thinning tree stands so that remaining trees would grow faster and produce more high-quality timber. In the four-county project, more than 200,000 trees were cut and hundreds were deadened to make more sunlight, moisture, and soil nutrients available to the remaining trees. The TSI made room for rapid growth of yellow poplar, sugar maple, black walnut, and red oak.

SCS District Conservationist Jerry Fox (right), Sewell Priest of the Agricultural Stabilization and Conservation Service, and Robert Whipkey (left) of the State DNR inspect one of the trees selected to be left after a timber stand was thinned.

In addition to helping landowners improve their timberland, the Elk SCD wanted to give jobs to local people to help reduce the high unemployment rate of about 22 percent.

Under Title X of the Job Opportunities Act (Public Law 93-567), the U.S. Department of Commerce granted the Elk SCD $19,100. The grant was used for 25 percent of the cost of thinning the woods.

The district also obtained 75 percent funding from the Forestry Incentives Program administered by USDA's Agricultural Stabilization and Conservation Service which cost shares various programs to get conservation practices on the land.

The district called on other agencies for assistance. The Soil Conservation Service made the initial contacts with landowners to explain the program and coordinated work done by the district crews.

The State Department of Natural Resources (DNR) evaluated sites, determined prospects for future tree growth, marked the trees to be cut or deadened, and certified that the crews had done the work. The DNR hired six forestry aides with its funds to help local foresters mark the trees to be cut.

The West Virginia University Center for Extension and Continuing Education helped the agencies carry out public information programs to encourage landowners to participate. The cooperating agencies prepared an exhibit on the work and presented it at the 1976 Mountain State Forest Festival at Elkins.

Under the TSI program, 93 landowners had their timber stands improved on 2,081 acres. The smallest parcel of land was 5 acres and the largest was 200 acres. Throughout the program, the district hired a total of 17 people. The district paid for about 10,000 hours of work at a cost of about $51,400.

Some landowners used the felled trees for firewood and other purposes on their own lands. Others left the felled trees on the ground to decay and enrich the soil.

In 30 to 50 years, the work will benefit not only the property owners, but wood processors and consumers as well. Robert Whipkey, a DNR forester, estimated the TSI in the Elk SCD will result in production of 200 to 250 additional board feet of high-quality lumber per acre per year.

As a result of the TSI program, landowners who were not involved in the program have become interested and have asked SCS for help in improving their timber stands.

Mr. Busfield is chairman, Elk Soil Conservation District, Gassaway, W. Va.
Mr. Fox is district conservationist, SCS, Gassaway, W. Va.

Nudging Nature

Little willows do a big job on the banks of Holmes Run.

by Stuart Finley

Teams of conservationists poke and plant in an effort to hold the streambank. The first person pokes a hole and the second plants the rooted cutting. The plant chosen for the site is blue arctic willow, a species that prospers in dense shade.

A band of concerned conservationists sloshed through the chilly waters of Holmes Run in Fairfax County, Va., in late March this year, digging small holes in the eroding streambanks and planting rooted cuttings of willow and dogwood.

The project was part of the Northern Virginia Soil and Water Conservation District's (SWCD) Vegetative Streambank Stabilization Program.

Under the program, the Northern Virginia SWCD planned a demonstration planting along parts of Holmes Run that were suffering erosion but were not yet severely damaged.

In planning, the directors discussed the project with Soil Conservation Service personnel including Plant Materials Specialist Curtis Sharp and District Conservationist Puller Hughes. Fairfax County cooperated in the effort and assigned its engineering consulting firm to select suitable sites for the revegetation work.

"Although streams are dynamic, ever-changing environments, many streams unaffected by man remain stable," Sharp said. "Plants on such streams are well adapted to the existing conditions. But, as we alter the watershed, existing conditions change, runoff is often increased, and erosion may follow. New vegetation may restabilize the streambanks naturally, but it is usually a slow process. A new set of plants must adapt to a new set of conditions.

"Planting adapted species on potential or existing erosion sites can help accelerate natural stabilization. The plantings on Holmes Run are an attempt to control erosion before it gets worse."

The district is concerned about streambank erosion throughout Fairfax County, but especially in the

A dibble bar makes planting easier, especially in hard-to-reach spots.

eastern part which was widely urbanized about 25 years ago. The district's long-range plans include rehabilitating streams there, some of which have cut back into the earth so badly that they have had to be channeled into paved ditches by concrete, riprap, or gabion baskets. Sections of other streams in the area are gradually deteriorating.

"In stabilizing streambanks," Sharp explained, "plants should be used which are well adapted to the stream and site conditions. Frequently, grasses such as tall fescue can be used alone if the stream is small and a good seedbed for planting can be prepared. But, as the size of the stream increases, the size and type of the plants to be used also change. Small shrubs such as dwarf willow or silky dogwood are ideal where the stream velocity is moderate."

Eroding streambanks are often in backyards or in parkland with a dense tree overcover. For the Holmes Run project, the Northern Virginia SWCD needed to find plant species that would prosper in dense shade.

The district, assisted by SCS, decided on two commercially available plants—blue arctic willow (Salix purpurea nana) and silky dogwood (Cornus amomum). The plants arrived in big bundles and, to the surprise of some of the participants in the project, Bill Sheads of the Virginia Division of Forestry chopped off excess tops and roots of the plants with an ax.

Sheads then explained to the group the use of the dibble bar in planting. A dibble bar is a heavy metal tool with a blade and foot pedal. It is thrust into the ground to make a hole for the plant. Then the plant roots must be maneuvered into the bottom of the hole so they will grow down instead of up. Also, the roots should

After planting, a slow release fertilizer is spread around the plant and tromped on.

The cuttings barely had time to sprout before they were tested. As small as they were, they managed to hang on and catch debris during a heavy rainfall.

not be twisted. The dibble bar should be reinserted a few inches away from the plant to close the hole. Slow release granular fertilizer is applied on the surface—not in the hole.

It takes two persons to plant one of the rooted cuttings this way. One dibbles; the other dabbles with the seedling and the fertilizer. Plants were spaced about a foot apart at the bottom, in the middle, and at the top of the bank along Holmes Run.

"For shady sites on small streams," Sharp said, "evergreen ground covers, such as lily turf or Hall's honeysuckle, are good. Tall and red fescue can be seeded on the same sites. Dwarf or medium-sized bamboo are shade tolerant and reduce erosion, although their value for this purpose has not been widely evaluated. Sites that are partially or completely in the sun can be planted with a wider variety of material.

"In addition to the plants mentioned above, deep-rooted, long-lived legumes such as flatpea or crownvetch can be added to the grass mixture," he continued. "On larger streams, 'Streamco' purpleosier willow, recently released by the SCS plant materials center in Big Flats, N.Y., has been widely used with good results. A native river alder, which occurs throughout the northeast, shows great promise although it has not been fully tested."

Vegetative streambank erosion control is less expensive and elaborate than concrete walls, paved ditches, and other structures. "A program of identifying potential or existing erosion sites, followed by selective plantings, will cost only a fraction of any engineering solution which may be needed if erosion along streambanks is allowed to continue," said Sharp. "Of course, vegetation cannot be effective in all locations and may not always be successfully established where it is adapted. But if revegetation is done properly, it can reduce expensive problems in the future."

Northern Virginia SWCD District Executive Mark Decot, a forester, emphasized the need to monitor the plantings along Holmes Run, particularly after storm events, to evaluate their effectiveness.

"Half of the worth of the Holmes Run project is simply the fact that we're trying," said Bob Keating, chairman of the Northern Virginia SWCD. "All of the people who came out to help with the planting went home happy—though aching—and better informed than when they arrived."

Mr. Finley is a director, Northern Virginia Soil and Water Conservation District, Fairfax, Va.

Even the little waterways leading into Holmes Run were sprigged with willows. Here, the survival probability is high because of lack of high velocity flood flows during storms.

Knowing and Growing Trees

by Gene Warren

Timber management is a long-term investment that takes careful planning and knowledge about such practices as thinning, fire protection, and harvesting.

Fred Loe talks plainly when it comes to trees. "Fact is, it just doesn't make a lot of economic sense to grow trees for market on a short-term basis on land that would sell for $500 to $1,000 an acre, and most land up here in north Louisiana is going for that," said Loe.

"But there's a lot more to growing trees than shipping them off to the mill," he added. "They are beautiful, provide homes for wildlife, and over a long period of time they will make a pretty good return on your investment."

Loe knows what he is talking about. He was selected by the Louisiana Forestry Association as Louisiana's Outstanding Tree Farmer in 1977. He is also a long-time cooperator with the Saline Soil and Water Conservation District.

Loe manages about 835 acres of family woods in Bienville Parish. About 80 percent of the woods is in plantations. Years ago, trees were planted in old cotton fields.

"I think the biggest thing we have done here is upgrade our woods," Loe said. "We started out about 20 years ago with some old worn-out fields and a hundred acres or so of badly cutover pines and hardwoods. We have planted, taken out the cull trees, thinned some thick stands, and protected the area from wildfires."

Loe makes a distinction between wildfires and controlled fires. "We use fire as a management tool," he explained. "When properly used, fire can be effective in making the forest floor a better place for tree seedlings and wildlife food plants to germinate.

"Also, since wildfires usually occur when debris on the forest floor has built up," he continued, "controlled fires can reduce the chances of wildfires by reducing the amount of debris."

About 650 acres of Loe's timber was harvested and thinned in 1977. The older stands yielded more than 1,000 board feet of logs per acre plus some pulp. The way Loe figures it, the next harvest, in 4 to 6 years, will average 1,000 board feet per acre on all the land and in about 15 years, the woods will yield more than 2,000 board feet of logs per acre each harvest.

"I tell people that you have to figure trees over a long period of time," Loe said. "Most folks don't have that much time, but in our case we don't depend solely on income from the trees for a living, so we can wait it out.

"I'm not saying that we couldn't sell our land, invest the money, and let it draw more interest than the woods are making," he continued. "Maybe that's a fact, but there is a thrill to me and the rest of the family in owning and managing timber."

About 10 years ago, Loe asked Don Parkman, Soil Conservation Service district conservationist, to teach him about timber management. One management practice he learned from Parkman was the D+6 method of thinning.

"The D+6 method means using the average diameter in inches of trees in a stand, converting the inches into feet, and adding 6 feet to determine the distance apart the trees should be," Loe said. "This allows plenty of crown space."

Fred Loe discusses his timber management plan with District Conservationist Don Parkman.

Loe admits that his cutting plans are sometimes altered by the current price of timber. "I study the market closely," he said, "so when the time is right, we can make a harvest."

All marking of Loe's timber is done by members of the family or by a trusted firm. "Selecting what trees to cut is important to the stand's future quality," Loe explained. "As I said, upgrading is a big factor in increasing the value of a stand of trees."

Loe has his roads well planned and knows just about every inch of the woods. He explains, "Tree growers have to know their trees just as dairy farmers have to know their cows."

Mr. Warren is public information officer, SCS, Alexandria, La.

Second Generation Conservationist

by Nancy M. Garlitz

Since he took over his father's farm in the hills of eastern Tennessee in 1957, David Garland has worked to conserve the natural resources on his 406-acre dairy farm and throughout Washington County.

His father was one of Washington County Soil Conservation District's (SCD) first cooperators. Garland too went to the SCD for help in conservation planning. He received technical assistance from the Soil Conservation Service.

Contour stripcropping, conservation tillage, crop rotations, sod waterways, pasture renovation, and planting trees on steep areas have helped Garland protect his land and increase production.

"My conservation program has helped me almost triple the farm's milk production," Garland said.

Garland usually has 120 to 135 cows producing milk at any one time. His total herd numbers 250. Rotating his crops enables him to produce most of the grain and forage his livestock needs.

All of Garland's crops are grown in strips on the contour. He uses a double cropping system on some fields in which he grows rye and wheat for silage, chisels and disks the field lightly, and then plants corn for silage or grain. Crop residues left on the surface protect the soil from erosion. Chisel plowing opens the soil and allows water to soak in, which also reduces erosion.

Garland uses conservation tillage on fields of corn and timothy. "Many other farmers in the county use conservation tillage on some or all of their crops," Garland said. "We're trying to save energy and soil."

Garland also rotates row crops with orchardgrass to reduce erosion on his sloping land and improve soil tilth and fertility.

As part of pasture renovation on his farm, Garland limes and fertilizes his fields according to soil tests. He mows the first crop for hay and his cattle graze the second crop. To reestablish clover in pastures of fescue sod, he overseeds with clover in early February. Garland mixes the clover seed with fertilizer and broadcasts it on his pastures. Grazing early reduces competition from the fescue and allows the seedling clover to get a good start. That way he doesn't disturb the soil by preparing a seedbed.

Besides working to reduce erosion, Garland is protecting water quality on his farm and further downstream in other ways. All natural drainageways on his farm are sodded with fescue. The grassed waterways safely carry runoff from his fields and filter out sediment and other pollutants.

Garland has a waste management system for his milking parlor and feedlot. A primary lagoon catches manure and wash water from the milking parlor and a secondary pond catches any overflow from the primary lagoon. The waste breaks down biologically in the lagoon and evaporates.

Garland spreads the manure he scrapes from his concrete feedlot onto his fields and the lagoon catches any runoff from the feedlot. When conditions aren't right for hauling the manure onto the fields, he puts it into the lagoon. When the lagoon fills up, he pumps out the waste and spreads it on the fields.

David Garland (right) and Jim Eldridge, SCS district conservationist, examine freshly cut orchardgrass and clover which will be used for hay. Garland will let his cattle graze the regrowth.

On slopes too steep to maintain in adequate pasture and control erosion, Garland has planted loblolly and white pine trees. Hardwood forests on his farm attract squirrels, foxes, raccoons, and opossums.

Garland has five ponds on his farm and he stocks them with bass, bluegill, and channel catfish. Besides providing recreation for his family and friends, the ponds also provide habitat for wood ducks.

Garland is serving his second year as chairman of the Washington County SCD board. He was appointed as a member of the board in 1962. He said he sees his job as chairman of the SCD board to be trying to help the county progress in its conservation efforts.

Ms. Garlitz is assistant editor, *Soil Conservation*, SCS, Washington, D.C.

If birds could read, they would be among the prime users of the inventory that tells . . .

Where the Wetlands Are

by Anne Schuhart

A farmer stops his tractor at the end of a row—time for just one more pass across the field before supper. He glances at the sky, looks again, and grins. "It's spring all right. Here come the ducks," he says to himself. He switches off the engine to hear the wingbeats and soft quacking as a flock of mallards passes directly overhead. His eyes follow the birds as they set their wings and land in a marsh at the other end of the field.

The marsh is small—just a few acres—but it's a problem, he thinks. If he drained it, he could make a continuous sweep with his equipment instead of always having to work around it. The soil's bound to be fertile there. It would give him a good yield.

But where would the ducks go? Most of his neighbors have drained their marshes. There are marshes to the south and a large reservoir farther north, but do the ducks need his marsh as a stopover during migration?

The chairman of a zoning board leans over a map of his county. He traces the river north from the county seat to the spot where a large corporation wants to build a new plant. He chews his pipestem. Should he recommend that the county grant a development permit for the site?

The company has assured the county that it will maintain strict pollution control standards, and it will create several hundred badly needed jobs. But something still worries the zoning board chairman.

Building near the river means draining some wetlands. He knows that certain wetlands act as blotters to absorb stormwater and help control flooding. Would flooding become a problem if the company's site were drained? Or would other wetlands in the watershed handle the stormwater? A lot of people live along the river in the older part of town . . .

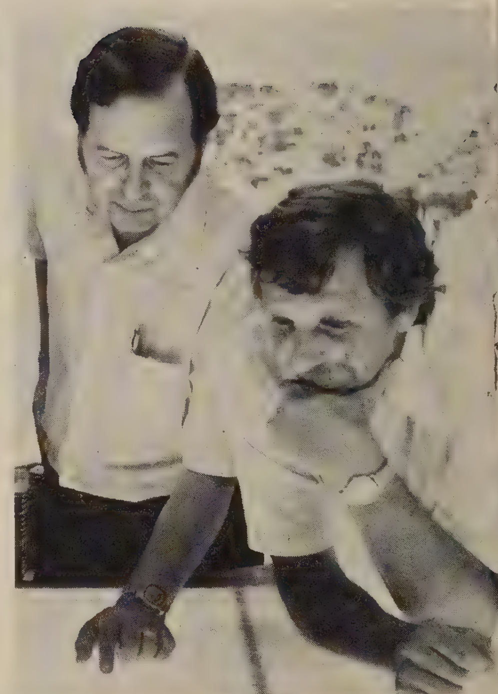
When a decision involving wetlands needs to be made, there often are many more questions than answers. There simply is little available current information about wetlands.

The National Wetland Inventory now underway is changing that. The inventory, which is being conducted by the U.S. Department of the Interior's Fish and Wildlife Service (FWS), will identify and map the wetlands of the United States and its territories. It is based on a new classification system that will provide data for a wide range of users, including wildlife managers, hydrologists, land-use planners, economists, engineers, and public and private agencies and organizations.

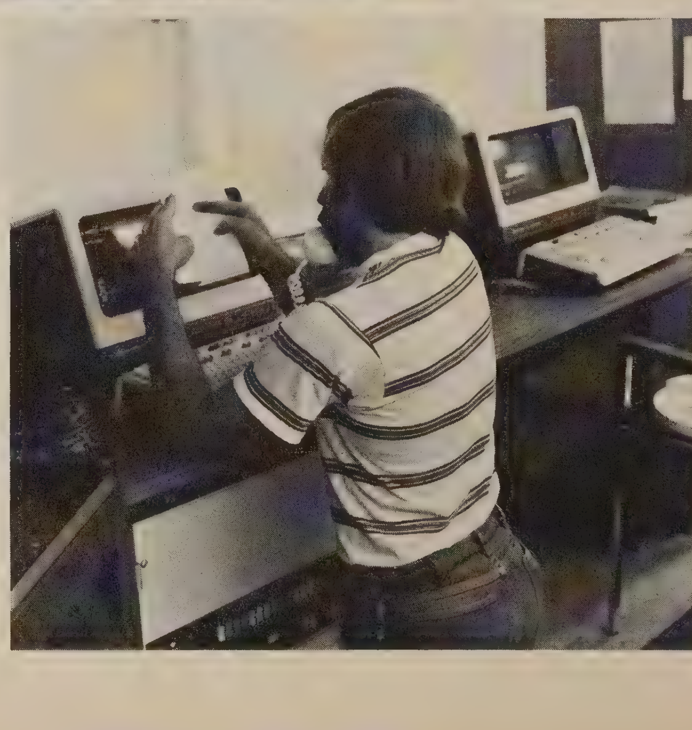
"I see this inventory as a balancing tool to help people make better decisions about the use and management of wetlands," said John H. Montanari, project leader for the inventory staff.

FWS initiated the inventory to supply information for processing permit applications for the use of wetlands and in managing its migratory bird wetland acquisition program. The inventory will delineate wetlands on a broad scale for analyzing migratory birds' breeding and wintering habitats. It also will provide data for environmental impact statements and data that can be used by many other Federal agencies.

The inventory will help State governments in planning and implementing coastal zone management programs and surface mine regulations, for example. It will help local



For the wetland inventory, unlike soil surveys, most of the mapping is done by photo interpretation instead of on the land. Areas of wetland are marked on aerial photographs. Cartographers (above) use a zoom transferscope to transfer information from the photos to maps.



Above, Blake Parker, SCS liaison (left), and John Montanari, project leader, discuss an interpretation on one of the maps.

Left, the inventory can be kept current with a new computer system, which will eventually replace most manual work.

governments and individuals in land-use planning. And it will help conservation organizations identify valuable wildlife habitat for preservation.

The last national wetland inventory was made in 1954 to assess the amount and types of waterfowl habitat in the 48 contiguous States. Since then, many wetlands have been drained, filled, or changed in other ways.

The new inventory will take these changes into account. It also will be more comprehensive, including wetlands smaller than 5 acres while the old inventory took in only those larger than 40 acres.

"We're trying to draw a line around every marsh and swamp in the country," Montanari said. "We will put the information onto a series of maps at a scale of 1:100,000. To cover the State of Florida, for example, we're talking about 46 maps at that scale.

"In addition, we will map wetlands in specific areas at a scale of 1:24,000. These will be areas where there is a high density of wetlands, such as the Mississippi River Delta or prairie pothole region. We also will make the larger scale maps in sensitive areas where wetlands are coming under pressure because of population, economic, industrial, or agricultural growth. Examples are coastal zones near metropolitan centers or surface mining areas in the West where there are fewer wetlands and the wetlands that do exist are very valuable."

The inventory information also will be put into a data bank. "The computer will group wetlands by State, county, watershed, size, physiographic region, ecoregion, and classification," Montanari explained.

"The readout for a particular map sheet will list the State, county, ecoregion, landform, hydrologic unit, type of wetland, wetland acreage, number of units, and the number and percent of acres and units that are farmed and not farmed."

Reports for each State, FWS region, and for the entire country will summarize the inventory data by wetland type, political subdivision, ecoregion, landform, and watershed.

Work materials collected for the inventory—such as collateral data, aerial photographs, compilation maps, work sheets, and field reports—also will be available on a limited basis.

The inventory itself relies more on technology than fieldwork. Unlike soil surveys, for example, most of the mapping is done by photo interpretation instead of on the land.

At the inventory headquarters in St. Petersburg, Fla., FWS personnel mark areas of wetland on aerial photographs and topographic maps. The photos and maps are then sent to contractors for interpretation.

Photo interpreters-biologists trained at the inventory headquarters interpret the photos and provide FWS with the type of wetland delineated and the type of vegetation growing there. Regional coordinators for the inventory make sample field checks of the interpretations to insure that the work complies with FWS standards.

Cartographers, also trained at the inventory headquarters, then use a zoom transferscope to transfer the information from the photos to maps. This minimizes distortion.

A new computer system, the Wetlands Analytical Mapping System III (WAMS III), eventually will replace most of the manual work. It does everything from drawing boundaries around wetlands to printing out maps.

With the WAMS III, the inventory can be kept current. The system can produce maps at any scale, freeing the inventory from a static base map. It also allows information to be added and updated continually.

"The National Wetland Inventory project was started in 1974," Montanari said, "but we found that before we could get to work, we needed some basic tools.

"We didn't know what States had done in the way of wetland inventories in recent years, so we put together an expanded bibliography. It's really a reference work of inventories conducted by Federal, State, and local governments and private organizations since 1965, complete with index maps.

"We also had to find out what areas were covered by aerial photographs that would meet our needs, and we published an atlas of recent high-altitude aerial photography."

The new wetlands classification system is the most significant of the tools developed for the inventory. The new system is hierarchical. It first classifies wetlands in broad categories according to their origin: marine, estuarine, riverine, lacustrine, or palustrine. It then defines wetlands

in several increasingly specific groups. The wetland inventory, however, only classifies wetlands according to the first three levels of the new system.

One key to the success of the classification system and the entire inventory is the cooperation among government agencies. "Other agencies, such as the Soil Conservation Service, the Army Corps of Engineers, and the U.S. Geological Survey, have contributed expertise we don't have and views we never thought about. Also, other agencies are more likely to use the inventory since we incorporated their input," Montanari said.

SCS, for example, has been involved in the inventory from the beginning. SCS personnel helped develop the classification system, particularly in determining relationships between kinds of soil and types of wetlands and wetland vegetation. They also helped test the system for ecological soundness at 22 sites around the country.

William B. "Blake" Parker, former assistant State soil scientist for Mississippi, represents SCS as a full-time member of the inventory staff at St. Petersburg. Parker interprets for the inventory soils data and other information already gathered by SCS in river basin studies, watershed plans, and soil surveys.

In turn, the inventory will supply SCS personnel with information they can use in making future soil surveys, river basin studies, watershed plans, and even in conservation planning with individual cooperators.

The operational phase of the National Wetland Inventory began in the fall of 1977. In just the first 28 days, 32 maps were completed and 13,792 wetlands were located and classified. Of these, 832 were larger than 40 acres; 6,592 were between 5 and 40 acres; and 6,368 were smaller than 5 acres.

"During 1978, we will have mapped most of the gulf and west coasts and a good chunk of the east coast," said Montanari. Mapping of most of the country is due to be completed by the end of fiscal year 1981.

Ms. Schuhart is a writer-editor, Information Division, SCS, Washington, D.C.

Above, data provided by the inventory will be useful in analyzing migratory birds' breeding and wintering habits.

Conservation organizations can turn to the inventory for help in identifying valuable wildlife habitat for preservation.

New Publications

Your Role in Conservation's Future

by the Soil Conservation Service

Because of the Soil and Water Resources Conservation Act of 1977, the public will have a voice in long-range planning decisions that will guide the future of the U.S. Department of Agriculture's conservation programs. "Your Role in Conservation's Future" explains the new law and how the public can participate in helping SCS and conservation districts develop a responsive conservation program.

The pamphlet explains the appraisal called for by the act and the national soil and water conservation program which is to be based on the appraisal. The appraisal and program are to be completed by the end of 1979 and updated every 5 years.

The publication also explains the evaluation of the national soil and water conservation program which SCS will prepare annually. A schedule of formal opportunities for public participation is given along with information about how to contact local conservation districts or SCS offices.

Single copies are available from local conservation district offices or from the Information Division, Soil Conservation Service, Room 0054–S, Washington, D.C. 20013.

The Idea That Worked: America's Conservation Districts

by the Soil Conservation Society of America

This educational cartoon booklet tells the story of soil and water conservation districts. It explains the role conservation districts play in halting erosion, improving watersheds, influencing the wise use of land resources, improving water quality, and expanding agricultural production.

The booklet is colorful and tells its story mainly through two district youth board members who help explain conservation districts to their city's business and professional club. It also shows how local government can help citizens protect the community's natural resources.

The booklet is the 11th in a series published by the Soil Conservation Society of America and written in cooperation with the National Association of Conservation Districts. The booklets are designed especially for teaching school children the wise use of natural resources. Teacher's guides are available to help teachers use the booklets in their classrooms.

Copies of "The Idea That Worked" are available from the Soil Conservation Society of America, 7515 Northeast Ankeny Road, Ankeny, Iowa 50021. Single copies are 35 cents. Teacher's guides are 25 cents. A complete set of all 11 booklets is available for $2. A set of teacher's guides is also $2. Prices differ for quantity orders.

Helping Wildlife: Working with Nature

by the Wildlife Management Institute

This booklet is directed at teachers and instructors in environmental and natural resources education. It is designed for use by youth groups, nature and recreation centers, libraries, hunter safety programs, and schools.

The booklet is a guide to teaching and learning basic ecological concepts of natural resources and wildlife habitat management. It defines and explains energy flow, food chains, the mineral cycle, influences of weather, habitat, ecological succession, wildlife population characteristics and dynamics, predation, and the role of the wildlife manager.

The text highlights key concepts, and illustrations include easy-to-read diagrams and charts. An annotated bibliography of books, newsletters, and magazines will help instructors and students locate additional information about wildlife management.

Copies are available from the Wildlife Management Institute, 1000 Vermont Avenue, N.W., 709 Wire Building, Washington, D.C. 20005. Single copies are $1. Prices differ for orders of 2,000 or more copies.

Plant Performance on Surface Coal Mine Spoil in Eastern United States

by the Soil Conservation Service

This report summarizes SCS evaluations of the adaptability of various plants to surface coal mine spoil in the Eastern United States.

Since 1946, SCS has assembled, evaluated, and screened many native and introduced species in an effort to find plants that adapt to conditions on mine spoil and provide erosion control.

Species that have widespread use or are best suited to special uses are discussed in the text. Information on special cultural and management practices required for a given species

or site condition is also given.

In the report, the eastern coal mining region is divided into 10 land resource areas. A map and descriptions of the elevation, climate, and soils of each area are given.

Following the text, all species tested in SCS plantings are listed in tables 1 through 5. The data in the tables are field observations from SCS plantings and plantings conducted cooperatively with State agencies and other Federal agencies. The text includes information from these plantings and from studies of plant performance in which SCS did not participate.

The tables give the performance of trees; shrubs, vines, and brambles; grasses; legumes; and forbs within land resource areas according to spoil groups, vigor, number of plantings, and age of planting. Spoil groups are listed as very acid (below pH 4.0), acid (pH 4.0 to 5.4), or slightly acid (pH 5.5 or above).

Sources cited in the text are listed in the Reference section at the back of the report. An index lists the scientific and common names for plants in the report and the page and table numbers where information about them can be found.

Single copies are available from local conservation district offices or from the Information Division, Soil Conservation Service, Room 0054–S, Washington, D.C. 20013.

Potential Cropland Study

by the Soil Conservation Service

This is a report of the study made by the Soil Conservation Service of the changes in the use of nonfederal lands in the United States between 1967 and 1975. It contains up-to-date statistical data at national and regional levels on the potential for converting land in other uses to cropland; the extent of land that can be readily converted; the problems related to developing the land for crop production, such as a seasonal high water table or a high erosion hazard; and land use changes and trends.

The study reports that of the lands converted to urban and other uses during the 8-year period, about 8 million acres were prime farmland. It also reports that the total acreage of cropland dropped from 431 million to 400 million acres. Declines occurred in most farm production regions, except in the Delta States region of Arkansas, Louisiana, and Mississippi and in the Mountain region, including Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming. About 111 million acres not now in crops have high or medium potential for conversion to cropland if needed. Only 34.9 million acres, however, can be converted without encountering soil erosion hazards or water disposal problems. Pastureland and rangeland acreage increased in every region.

The text and three appendixes include tables, graphs, and diagrams. Appendix 1 consists of five tables that are divided into 12 parts—one for the national summary, one each for the 10 U.S. farm production regions, and one for Hawaii, Alaska, and the Caribbean Area. Table 1 shows 1975 land use by capability class and subclass. Table 2 shows changes in land use between 1967 and 1975. Tables 3, 4, and 5 show 1975 data on the potential for conversion of land that is currently in pasture and range, forest, and other uses to cropland; the kind of development needed for the conversion; and the potential for conversion to cropland by capability class and subclass.

Appendix 2 describes the method used in the study for estimating coefficients of variation for the national acreage estimates. Appendix 3 has definitions of terms used in the study and explains the land capability classification system.

Single copies of "Potential Cropland Study" (Statistical Bulletin No. 578) are available from the Office of Governmental and Public Affairs, Room 502–A, USDA, Washington, D.C. 20250.

PLUARG Report:

A Guide to Improved Water Quality in the Great Lakes

In its final report to the United States and Canadian International Joint Commission (IJC), presented in Canada this summer, the Great Lakes Pollution from Land Use Activities Reference Group (PLUARG) suggested comparing point and nonpoint source alternatives for achieving cost-effective pollutant reductions.

According to the group's report, the Great Lakes are being polluted by runoff of phosphorus from some land uses, principally from agricultural and urban areas. PLUARG estimates that about 41 percent of the total phosphorus loads to the Great Lakes comes from nonpoint sources, mainly carried by fine-textured sediment.

PLUARG suggests stressing site-specific approaches to reducing phosphorus, sediment, and toxic substances entering the lakes.

PLUARG recommends that governments make better use of existing programs and agencies, such as soil and water conservation districts, to reduce pollutants reaching the Great Lakes. The group suggests that water quality management programs, such as 208 implementation in the U.S. portion of the basin, should be voluntary. Regulation should be used only when voluntary approaches do not result in reduced pollution.

A PLUARG survey of farmers in the Great Lakes area supports the voluntary approach. Some 56 percent of the Canadian farmers and 71 percent of the U.S. farmers surveyed said that the best policy for reducing water pollution is to rely solely on the voluntary cooperation of farmers.

PLUARG suggests that all levels of government review the adequacy of their present voluntary programs first to determine if more specific guidelines or incentives may be needed.

Meetings:

November

7–10	Future Farmers of America, Kansas City, Mo.
10–13	National Agricultural Plastics Association, Miami Beach, Fla.
12–15	National Association of State Universities and Land Grant Colleges, St. Louis, Mo.
12–15	National Forest Products Association, Palm Beach, Fla.
12–16	American Institute of Chemical Engineers, Miami, Fla.
13–17	National Conference on Urban Forestry, Washington, D.C.
13–20	The National Grange, Denver, Colo.
19–22	American Society of Landscape Architects, Atlanta, Ga.
29	No-Tillage Systems Conference, Griffin, Ga.

December

3–6	American Society of Farm Managers and Rural Appraisers, Inc., New Orleans, La.
3–8	Joint Meeting of the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America, Chicago, Ill.
4–8	American Geophysical Union, San Francisco, Calif.
5–7	Western Forestry and Conservation Association, Sacramento, Calif.
6–8	Keep America Beautiful, Inc., Washington, D.C.
11–13	National Symposium on Strategies for Protection and Management of Floodplain Wetlands and Other Riparian Ecosystems, Atlanta, Ga.

January

3–8	American Association for the Advancement of Science, Houston, Tex.
8–12	North American Game Breeders and Shooting Preserve Association, Kansas City, Mo.
9–11	National Council of Farmer Cooperatives, Las Vegas, Nev.
14–18	American Farm Bureau Federation, Miami Beach, Fla.
22–26	National Cattlemen's Association Convention and Trade Show, Houston, Tex.
28–31	National Wool Growers Association and National Lamb Feeders Association Joint Convention, Las Vegas, Nev.

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Soil Conservation

December 1978

U.S. Department of Agriculture

Innovations in SCS Planning Assistance

From the Administrator

SCS a few months ago launched a new approach to conservation planning. In essence, we asked SCS field personnel to begin working more flexibly with conservation districts and their cooperators in planning only what land users want and need to sustain soil and water resources.

We asked the field staff to continually use their knowledge, initiative, creativity, and management skills to provide the kind of help people want.

The new approach is responsive to some recommendations of the General Accounting Office; the findings of recent studies, notably a statewide study by the North Dakota Association of Conservation Districts; and SCS's own evaluations of years of planning experience.

Most land users, we learned, carry out planning decisions within the first 2 to 3 years after planning. No single factor is more important than that in the SCS redirection to more flexibility.

Conservation planning is just as important today as it ever was, probably more so as demands on the natural resource base increase.

But we need to keep planning in perspective. It is a continuing process, and a conservation plan is an intermediate step in the process—not an end in itself.

Our vital, critical goal remains what I call our final product: conservation on the land, positive results on the ground.

SCS had the cooperation of the National Association of Conservation Districts in developing the new planning concepts. And we have been encouraged by NACD and other conservation officials to pursue their implementation with vigor.

In a recent letter to SCS employees, I expressed the belief that we will succeed in the new planning approach to the degree that SCS, districts, and cooperators work together in greater harmony.

The SCS planning concepts offer all of the conservation partners at the local level the opportunity to meet the challenge of unremitting change and mushrooming demands in resource management.

It is probably too soon to tell how well the new approach is working nationwide. But like the end product SCS and districts seek together, the measures of our progress eventually will be highly visible: More SCS and conservation district conservationists out of the office and out on the land, working and talking with land users, examining, evaluating, and promoting conservation practices and conservation systems.

Mel Davis

December 1978, Vol. 44, No. 5

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Bob Bergland
Secretary of Agriculture

Mel Davis, Administrator
Soil Conservation Service

Prepared in the Information Division
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Soil Conservation

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Farming reclaimed surface-mined land is a successful venture for one Pennsylvania landowner. See article on pages 8 and 9. (Photo, Lee Shields.)

Calls from the Wild

by Gordon S. Smith

An office complex looks like it grew up with the grass and trees in a New Jersey community, thanks to natural resource planning.

"It's an office complex that combines strict environmental protection requirements with business management needs," said Candace Ashmun, environmental commissioner for Bedminster Township, N.J. She was describing the recently completed American Telephone and Telegraph (AT&T) Long Lines Department national headquarters which sits on a wooded hillside overlooking the North Branch of the Raritan River.

"We enjoyed the option of accepting the AT&T building proposal only if it met the exact specifications of our township planning and zoning ordinances," said Ashmun, who is also an official of the Upper Raritan Watershed Association. "AT&T agreed to do everything we asked so the result is good land use for this tract of land."

AT&T Supervising Engineer Burdick Pierce added, "This new Long Lines facility represents the most extensive conservation planning project of any new AT&T office building. For years we have consciously guarded against excessive uprooting of the surrounding landscape when new facilities were being built. Tree planting and land protection have been important elements of our construction work. But this Bedminster project marks the first time that the buildings and everything connected to them have been planned to fit into the surrounding environment."

Faced with the necessity of moving from their inadequate New York City Long Lines office, AT&T officials considered 55 possible locations for a new office in northern New Jersey. They were restricted to that general area because they needed to be near other Bell System facilities that were already built or under construction. A 422-acre tract between Interstate Highway 287 and the North Branch of the Raritan River in Bedminster Township met most of their requirements.

Bedminster Township is made up of rolling wooded hillsides dotted with estates and old farms. Its geology, soils, topography, and location at the headwaters of the Raritan create a fragile environment. The township, to protect the environment, strives to maintain a low-density land use pattern. The fact that the new AT&T facility had the potential to double their tax revenues held little interest for local people. Bedminster could afford to insist on a complete natural resource conservation plan for the new AT&T office complex. AT&T officials agreed to follow the township's land use restrictions.

A few years ago, Bedminster's planning and zoning board redrafted the local zoning ordinances to require the investigations and provide the flexibility needed for making sound land use decisions. Included in these ordinances were requirements based on New Jersey's "Standards for Soil Erosion and Sedimentation Handbook." The Soil Conservation Service had given the State technical assistance in developing the standards. SCS work in resource conservation

During construction, runoff passed through the debris basin (far left), where most of the silt settled out. Today, this same debris basin (near left) is part of the landscape and overall drainage system.

and the agency's county-by-county national soil survey program provided the basis for much of the information in the handbook and in the Bedminster ordinances. The $40 million AT&T project gave Bedminster its first real chance to test the safeguards.

Based on local input and the Bedminster planning board's environmental requirements, the office complex was designed to fit the landscape. Though AT&T had purchased 422 acres, only 29 acres were involved in the building project. The rest will be kept open under a perpetual deed restriction. The low profile of the building and the surrounding tree cover almost hide the complex from view from nearby roads. All-electric heating eliminates any air pollution problems. A tertiary sewage disposal plant designed to treat twice the estimated needs removes any threat of pollution from that source. The complete conservation landscaping plan eliminates the danger of excessive erosion.

Before approving AT&T's building plans, the Bedminster planning board required an environmental impact statement from the company detailing all aspects of the proposed project and the effects of construction and the finished complex on the community's natural and economic resources. In approving the AT&T plan, Bedminster officials also required that several conservation measures be included. The Somerset-Union Soil Conservation District and the SCS technical staff that works through the district advised the township on the needed conservation measures.

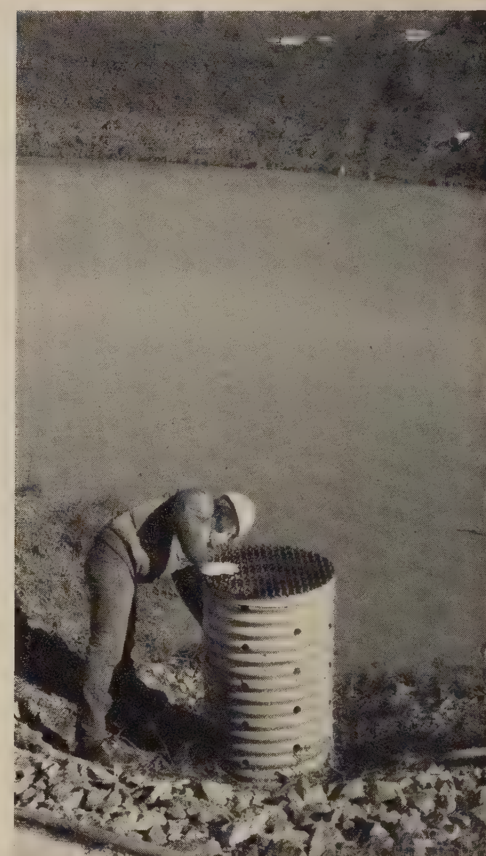
With AT&T funds, the township hired an engineer to be a full-time inspector on the construction site during the 38-month building period. The inspector checked compliance with all the environmental requirements set by the Bedminster planning board. A monitoring committee was also established to report environmental concerns to the township during construction.

When construction was started, the first conservation step was shaping two large debris basins at the foot of the hillside below the building site. Two diversions—shallow ditches backed by a mound of earth—ran 1,800 feet across the lower side of the construction area to the two basins. These diversions collected all runoff water and carried it to the basins, where most of the silt settled out. Then, as the runoff water passed through the basins' outlets to the small natural stream below, small dams made of baled hay intercepted any remaining silt. By the time the water from the construction site reached the Raritan River, it was practically free of silt. The two debris basins were designed to hold back millions of gallons of potential floodwater during excessive storms.

In clearing the land for construction, 130 trees were carefully removed and stored in a temporary tree nursery beyond the site. Wood chips from trees that had to be destroyed were stockpiled for later use.

At left, natural woodland vegetation was left undisturbed within a few feet of the building during construction. At right, about 130 trees of various sizes and species were transplanted to a temporary nursery before construction began. The trees were used later in landscaping the new office complex.

The outlet pipe at this debris basin was designed to hold back sediment while excess water passed on to the river. SCS designed the basin as part of the conservation plan.



Topsoil from the site was removed and stockpiled for use in landscaping work. The 3,500-cubic-yard topsoil hill was dwarfed by an even larger mountain of earth excavated from the building site. Both mounds were seeded with temporary grass mixtures to prevent erosion. In fact, any disturbed land was seeded or otherwise stabilized within 30 days, according to the land use specifications.

The perimeter of the construction site was fenced to keep construction equipment out of adjacent undisturbed areas. Both AT&T and Bedminster wanted to have as much land as possible remain in its natural, undisturbed state.

To insure continued good water quality in the North Branch of the Raritan River, nine water-sampling stations were set up on tributaries on the AT&T property. Biweekly recordings of water quality before, during, and after construction provided data to insure that the Raritan River remained an acceptable water supply and that fishing continued to be as good as ever.

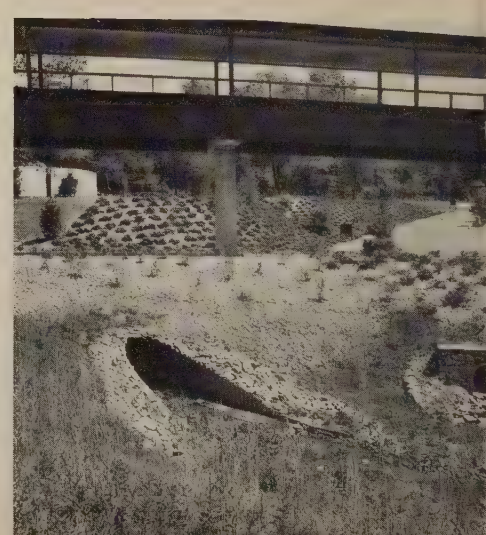
Today, the AT&T Long Lines office complex is complete and doing business. More than 3,000 employees are working in an office atmosphere surrounded by many of the advantages of country living. Inside, tropical trees and flowering shrubs dominate a four-floor, skylighted atrium in each of the three sections of the complex. Outside, the landscaping, though not yet a year old, looks like it has been in place for several years.

A large beech tree planted near the visitors entrance stands taller than the building. It was one of the 130 trees stored in the temporary nursery during construction. More than 90 other trees of all sizes were transplanted from the nursery to become part of the new landscape around the building.

The diversions below the building site have been leveled. They are no longer needed because the ground is now protected by lush grass.

Instead of running into the Raritan River, this sediment (left) has been captured and stored in the debris basin.

Natural drainage patterns at the site were maintained as much as possible (right). Here, two small streams meet to run down the slope just as they did before construction began.



This grass-covered hill is actually a 3,500-cubic-yard mound of topsoil shaved from the construction area. It has since been spread on the land around the new AT&T buildings.

The smaller of the two debris basins, built to hold the muddy runoff from the diversions, is also gone. The other debris basin has been made into a picturesque pond, as planned, and it still has the flood control capability of holding back excess water from the nearby Raritan River during heavy rainstorms.

The mountain of topsoil stockpiled during construction has been spread across the land disturbed by construction. It was sodded and seeded and now has a deep grass cover.

Nature trails made of wood chips from discarded trees wind through the nearby wooded areas that were untouched by the construction work. In a few places, access roads that were needed during construction have been made into nature trails. The trails get considerable use by AT&T employees during lunchtime when the weather permits.

The usual acres of asphalt parking lots that surround most large office buildings do not exist at the AT&T complex. Two multilayer garages have kept this type of land use at a minimum.

Looking to future landscape efforts, AT&T Engineer Pierce reports that a land management plan for postconstruction conservation work is already in operation. Ashmun has recommended various procedures for maintaining adequate erosion and water runoff control. Drainage ditches need to be kept mowed and cleared of debris. Some grassed areas near the woods should be allowed to revert to their taller natural vegetation. A layer of wood chips needs to be maintained around shrub plantings, especially on slopes. This will control any possible erosion in those areas plus provide some nutrition to the plants. Another nature trail along the Raritan River is planned to connect with the existing trails.

"We think our new Long Lines building is an outstanding example of a large office complex designed to fit the specific requirements of the land it is built on and still meet our original objectives," said Pierce.

Recently, AT&T Long Lines received the Good Neighbor Award from the New Jersey Business Magazine for their outstanding environmental work. Conservationists involved in the project agree that it is an excellent example of tailoring industry to fit the landscape. As such, it sets the pace for better conservation planning in similar developments and represents a tremendous advance in the continuing effort to bring about proper land use in many fast-growing urban communities.

Mr. Smith is head, information staff, Northeast Technical Service Center, SCS, Broomall, Pa.

Adapted from an article in *Landscape Architecture*, May 1978 issue.

At left, juniper plants and wood chips protect this sloped garden area near the new offices. Wood chips were also used to cover a nature trail (at right, foreground), which provides employees with a relaxing walking area.

A Better Farm After Coal Mining

by Frederick E. Bubb
and Lee B. Shields

Long after the coal is gone, the crops will still be thriving on a reclaimed farm in Pennsylvania.

Good mined-land reclamation puts a feather in the cap of the miner and the farmer, Glenn Scott says.

He should know—he has returned two farms to agricultural production after they were stripped for coal.

A fourth-generation dairy farmer in Pennsylvania's pleasant Stony Creek Valley, Glenn was not about to give up his career or his natural resources just because the slopes behind his house contained a million dollars' worth of coal.

Surface mining elsewhere in Somerset County and throughout the Keystone State had left lasting scars on local communities. Recent State and Federal laws will help repair some of those scars and prevent them on new mines, but Glenn says that "too many times the fault is with the landowner. He cannot wait until the mining is finished to make decisions or plans to restore the land.

"Inspectors are watching mine operators for today's safety and water quality problems. There is not enough looking to the future use. Every landowner should have a conservation plan before he allows stripping."

Glenn and his wife Janet and son David run a 105-acre dairy farm that supports 43 milk cows and 40 heifers and calves. The farm of Janet's parents just across the road was stripped for coal beginning about 1960. Glenn was impressed with the coal company's work, and with his own ability to help return the farm to good production.

The coal shovel came to his own hillside 8 years ago, and the Scott farm became one of the more than 200 active mines in the county.

Glenn didn't mind having part of the hill removed. "Before stripping, I had two steep ravines breaking up this slope," he said. "I had contour strips and a diversion, but because of those ravines, my fields were short."

A long-time cooperator with the Somerset County Soil and Water Conservation District, Glenn made sure that his agreement with the coal company for the mining and reclamation included contour strips, diversions, and grassed waterways. They were planned with the help of the Soil Conservation Service and installed by the coal company.

The agreement also specified that Scott and the coal company would share equally in costs for lime, fertilizer, and seed. Lime and fertilizer needs for restoring fertility were based on a soil test. Glenn was surprised that only 2½ tons of lime was needed per acre.

Other parts of the mining and restoration work were verbally agreed to by Scott and the coal company. That worked fine, Glenn said; the company foreman was there virtually every day assuring a good job. But Glenn recommended that a farmer have every phase planned and agreed to in writing, to protect himself and the miner.

The agreement also should provide for removing and stockpiling topsoil

and subsoil separately, Glenn says. "The best way is to use the soil survey to determine the average depth which should be stripped off."

Glenn allowed some building debris and other waste to be buried in deep pits. He wouldn't advise anyone else to do it—parts of the hillside have settled differently and affected the diversion terrace grades. Specifications for dumping and backfilling should be set down in advance.

When the reclamation is done and the farming resumes, Glenn says the farmer should return as much organic material as feasible to the soil each year. Animal waste can help rebuild soil fertility and structure—its effect will show up faster than anything else.

A few wet areas remained after the mining, although the stripping actually improved drainage on the Scott farm. Glenn advised, "Don't be in too big a hurry to go to underground drainage. Wait a few years until the soil structure rebuilds. This may solve the wetness problem. If not, then the farmer can ask SCS to help establish a drainage system."

Glenn figured that it would take 3 or 4 years to get the farm back into shape after half of it was mined. He is right on target.

In the first year, he harvested 10 tons of corn silage per acre—about half the usual yield. He also combined 25 bushels of buckwheat per acre and got an excellent stand of grass-legume hay.

Not bad considering the hillside was still in spoil piles until April that year! Not bad considering he thought his only crop would be stones!

His first returns were enough to cover seed and fertilizer costs, and improved the next year. He figures that in another year or so yields will be as high as they ever were—or better.

Glenn is most proud that "From my part of the hill, no silt has ever reached the road. That isn't true on other farms.

"My son wants to farm, and I want him to have a better farm than I did. I would not have removed the coal if I was not sure I could retain my agricultural land and production."

The Scotts have protected their land and their future, as well as doing their share to guard the quality of Pennsylvania's streams. Janet Scott says, "You have to make every acre count."

The Scotts feel strongly that the landowner needs to take some responsibility to see that surface mining does not leave an eyesore.

They have done just that—and more.

Mr. Bubb is public information officer, SCS, Harrisburg, Pa.
Mr. Shields is assistant director, Information Division, SCS, Washington, D.C.

Some of the contour strips on the Scott farm cover scars of surface mining.

Glenn Scott and SCS District Conservationist Ron Phelps discuss good growth of soil-holding plants on a surface-mined hillside.

All in a Day's Work

by Ted Kupelian

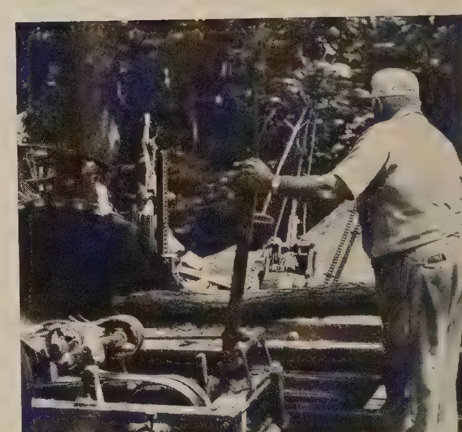
One day,
500 volunteers,
200 machines,
and
13 conservation practices
on
245 acres
add up to
reduce erosion.

While helicopters and airplanes circled overhead, about 500 volunteers, 200 machines, and several thousand onlookers joined forces in a down-to-earth display of community pride and cooperation. Called Project Clearwater, the massive 1-day conservation demonstration showed farmers and others how to prevent erosion and water pollution from agriculture.

The 245-acre Warren Roelkey farm in Frederick County, Md., was se-

SCS District Conservationist Paul Edwards (left) and Warren Roelkey discuss the conservation practices installed on Roelkey's farm in Frederick County, Md.

A bird's eye view of the Roelkey farm shows some of the work well underway—the pond (center), contour stripcropping (background), fencing, and barn repair.



At right, trees, which were thinned as part of the timber stand improvement plan on the Roelkey farm, were sawed into lumber. Daniel C. Poole, Project Clearwater chairperson and member of the Catoctin Soil Conservation District, takes a turn at the saw mill (top photo). Volunteers used some of the lumber to improve fencing on the farm (bottom photo).

Throughout the day, tractors pulled haywagons full of visitors around the farm to 13 tour stations. Guides at each station explained the conservation practice being installed and other improvements.

lected by the Catoctin Soil Conservation District as the site for the transformation.

The Federal Water Pollution Control Act, passed in 1972 and amended in 1977, requires farmers to control, to the extent feasible, nonpoint source pollution, including soil, animal wastes, fertilizers, pesticides, and other chemicals that wash off land and pollute waters.

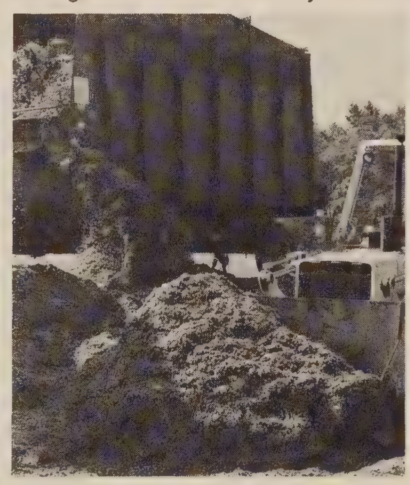
Land which is under development puts the highest amount of sediment, per acre, into streams, but badly managed farmland is the second largest cause of erosion.

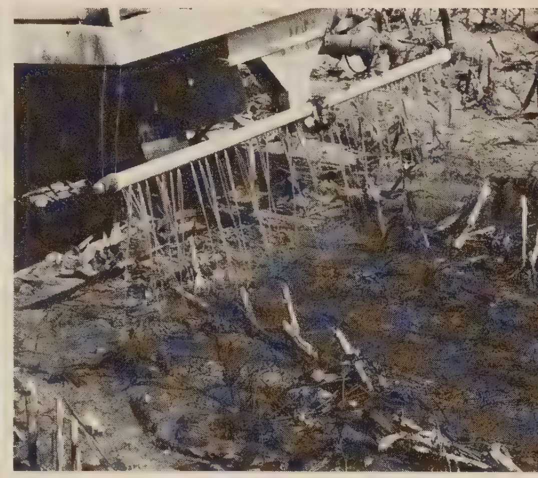
About 3 billion tons of soil wash off the Nation's cropland each year. Before Project Clearwater, about 2,900 tons of soil on the Roelkey farm eroded annually. After the project, erosion should be reduced by about 80 percent.

Conservation practices installed during Project Clearwater included contour stripcropping, relocating fences, tile drainage, pasture renovation, a 1.1-acre pond, waterways, diversions, timber stand improvement, livestock watering troughs, a walk-in watering facility, an animal waste management system, stream stabilization, and a drop structure.

Mr. Kupelian is a writer-editor, Information Division, SCS, Washington, D.C.

Silage was cut and carried to a concrete-lined trench silo. The corn was cut, in strips, while still green. In the silo it will produce an acid which prevents it from spoiling. The silage is fed to livestock during the winter when they are unable to graze. On the strips where the corn was cut, the seedbed was prepared for a mixture of timothy and clover.





Volunteers installed diversions on the contour to reduce the distance water must flow downhill in the sloping fields and to direct the water to suitable outlets.

"Before" and "during" Project Clearwater—the barn takes on new boards and fresh paint and a new fence goes up around it.

Below, two types of livestock watering facilities were installed on the farm. One was a concrete trough with concrete apron and the other was a walk-in facility built of cross-ties.

Above, as bulldozers work on the pond in the background, volunteers repair the springhouse and prepare a trench. A pipe will be buried in the trench to carry overflow from the pond to the stream.

The Maryland Water Resources Administration installed a water monitoring device in the stream. Samples taken after Project Clearwater will be compared with "before" samples for improvements in water quality.

Workers lay sod for one of the waterways. They begin at the lower end of the grade and work up. Like shingles on a roof, the sod strips at the upper end overlap the lower ones, thus preventing water from forcing up the edges.

Below, gullies in the pasture had to be filled in and shaped before seeding.

Spraying a mixture of water, grass seed, fertilizer, and mulch on disturbed areas around the pond—including the banks, dam, and spillway—will help grass to root quickly. The grass will anchor the soil and prevent erosion.

At left, bulldozers dug in to build a 1.1-acre pond on the farm. The pond will catch runoff water from the mountains and provide water for livestock.

Crops Sprout on Spoil

by Ronald D. Morse, John M. Swiader, and P. J. Porpiglia

Turn a mine spoil into a vegetable garden? Virginia scientists say yes, with the help of sawdust and black plastic.

Tomatoes were grown on strip mine spoil (above) to which sawdust had been added. The sawdust improved the soil's water infiltration and retention rate. The yield of vegetables grown on the mine spoil (right) was comparable to the national average.

To landowners and mine operators surface-mined land has been more of a nuisance than an asset. It is associated with problems of erosion and pollution. Speculations that perhaps one day the land could be used for agricultural production were left to dreamers. But, based on the results of trial plantings made on areas of reclaimed surface mine spoil in southwestern Virginia, it could be more than just wishful thinking.

In 1976, researchers at Virginia Polytechnic Institute and State University began working on a new use for surface-mined land spoil—vegetable production. Field studies were conducted at actual mine sites to determine the cultural practices required to support vegetable production on mine spoil.

Grants for the work were received from a local coal company and from USDA's Science and Education Administration supported by the Interagency Energy/Environmental program of the U.S. Environmental Protection Agency.

The two planting sites selected were 2- to 3-year-old surface-mined areas in Wise and Buchanan Counties. They were relatively flat and had no serious erosion problems. The two sites had also been properly mined and stabilized. Most of the pyritic, or acid forming, materials had been deposited beneath the more productive shale and sandstone overburden. After mining and the replacement of overburden at the sites, the spoil had been graded, leveled, limed, fertilized, and seeded with a standard mixture of sericea lespedeza and Kentucky 31 tall fescue.

Before planting in the spring of 1976, the soil was tested to determine its physical and chemical properties. The pH averaged 5.2 at the site in Wise County and 7.9 at the site in Buchanan County. The spoils were classified silt in texture and had weak physical structure and porosity de-

velopment. The organic matter content was very low, resulting in crust formation and poor water infiltration.

The research in 1976 focused on evaluating the effect of using sawdust as an organic amendment to improve the soil and increase crop yields. Lime and fertilizer were added based on the soil test and on standard vegetable requirements for Virginia soils. Weathered sawdust applied at 20 tons per acre (dry weight) was either incorporated into the top 6 inches of spoil or used as a 1-inch surface mulch. A control plot was established which was not treated with organic additives.

Green beans, cabbages, tomatoes, and sweet peppers were grown under each spoil treatment and evaluated for yield, quality, and their overall adaptability to mine spoil. Except for one nitrogen application midway through the growing season, the plants were given no additional fertilizer.

Results from the first season were very promising. Yields of cabbages, tomatoes, and green beans under sawdust treatments were on the whole comparable to the U.S. average and the vegetables were of excellent quality. Yields from the control plots were considerably less than those of both sawdust treatments and the vegetables were of inferior quality. The sawdust treatments improved the soil's water infiltration and retention rate. These properties appeared to be the factors most limiting to normal plant growth and development.

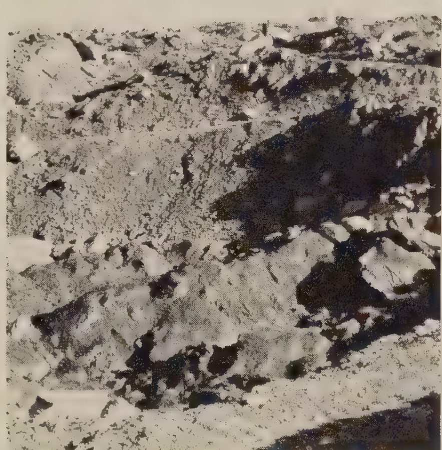
In 1977, the research was expanded to include an evaluation of black plastic mulch on surface mine spoil. The number of vegetable species was also increased to include broccoli, cucumber, summer squash, and winter squash.

Results from the 1977 season averaged higher yields than the previous year. Except for broccoli, all vegetables grown on the plots treated with sawdust were equal to or superior to the U.S. average. The black plastic proved to be an especially effective mulch for warm season vegetables such as tomatoes, peppers, cucumbers, and squash. Yields of most species grown on plastic mulch were double that of the control plots where no mulch was used.

From the results of the research, vegetable production appears to be a viable alternative for the use of surface-mined land. Through the use of organic amendments, surface mine spoil can be modified to support vegetable crops. But whether it is feasible on a large scale remains to be seen.

Mr. Morse is an associate professor of vegetable production, Mr. Swiader is a research associate, and Mr. Porpiglia is a graduate research assistant at the Virginia Polytechnic Institute and State University, Blacksburg, Va.

Strip mining causes total upheaval of the land, often leaving it barren and scarred (right). If toxic materials are covered with nontoxic overburden, the area can be reclaimed and stabilized with plant cover. On the sites selected for testing, the newly deposited strip mine spoil had to be leveled, graded, and fertilized (far right) to prepare it for planting.



The Eyes Have It

by Steve Foland

The environmental eye uses switchback and diversion tactics to set a trap for animal waste.

"Environmental eye" may sound like a spy in the sky, but to dairy farmers in southwestern Wisconsin, it means inexpensive and effective control of animal waste.

The Lafayette County, Wis., Soil and Water Conservation District (SWCD) coined the term in 1973 for a waste management system made up of a diversion above and a retention dam below a barnyard. Viewed from the air, the diversion and dam combination looks like a giant eye.

The diversion prevents run off from higher surrounding land from running through the barnyard. The retention dam keeps the water that falls on the barnyard from running off and carrying animal waste into waterways.

"The typical barnyard around here is steep and is beside a stream," said Orville Kurth, Soil Conservation Service district conservationist in Lafayette County. "Almost every barnyard in the county could use some form of runoff control, but some need less than a complete environmental eye."

The barnyard on the farm owned and operated by Guerdon Voights and his son Harry is so high on the landscape that an upper diversion would have served no purpose. A spring-fed stream, however, runs by below the barnyard. "We had to keep waste out of the water somehow," said Harry. "The stream runs through the town of Belmont after it leaves here."

The Lafayette County SWCD and SCS helped the Voights construct a concrete slab waste-holding area, a retaining dam, and a holding pond for liquid waste below their barnyard. It took 2 years to complete the work.

"We were shocked at the amount of waste the dam trapped," said Guerdon. "Before the dam was built, I guess the waste just disappeared into the stream."

The Voights always had a field road below their barnyard. The road was gullied, difficult to keep graveled, and sometimes washed away. Since the installation of the retention dam, the Voights say the road is stable and easy to maintain.

On another Lafayette County farm —owned and operated by brothers Bill, Ron, and Doug Woodworth—runoff from about 10 acres of cropland passed through the barnyard. A highway runs by the barnyard, and, as Doug said, "That road carries a lot of city traffic. People could look right down into our barnyard, and it was getting pretty messy."

The Woodworths decided to use the waste from their barnyard as fertilizer for their crops. They worked with the Lafayette County SWCD and commercial engineers to design a system most suitable for their needs. The brothers constructed two extensive diversions above the

barnyard to eliminate the runoff from the cropland, then built a 4-foot-high wall below the barnyard to trap the animal waste. A pump beside the wall transfers the waste by pipe to a commercial holding tank that the Woodworths installed near the highway.

"We knife the liquid waste into about 120 acres of cropland," Doug said, "and we have cut our fertilizer bill on that land in half.

"When we went into this, we expected the system to pay for itself in 10 years. It looks now like the system will pay for itself in 4 years, not including the savings in labor that the diversions and wall brought about."

In Crawford County, SCS helped Glen Beneker design a serpentine diversion system below his barnyard to catch and hold runoff waste. The serpentine forces the runoff to travel across the slope on the contour for some distance before allowing it to descend and switch back along the slope. The successive diversions slow the water considerably, reducing its ability to transport barnyard waste.

"I had my doubts about the diversion's effectiveness when it was being built," said Beneker, "but you can see that the third switchback is virtually free of waste. And the only maintenance the diversion requires is periodic removal of dried waste."

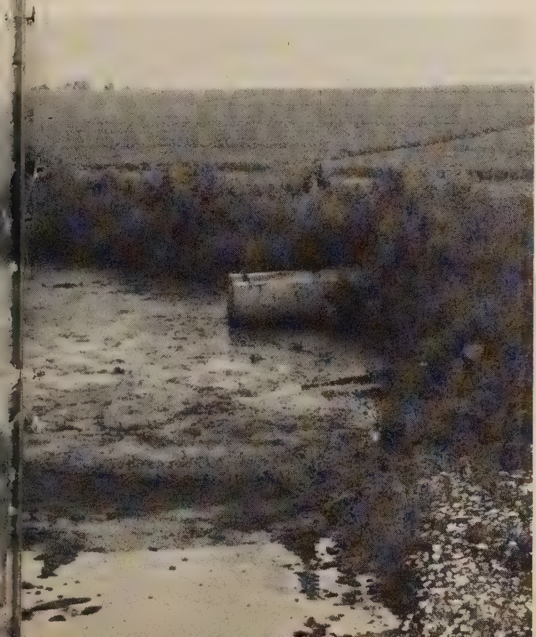
In constructing their tailormade versions of environmental eyes, the Voights and the Woodworths received cost-share assistance through the Agricultural Conservation Program. The Benekers received cost-share funding from the Crawford County SWCD.

The Woodworths were committed to cleaning up the area beside the highway even if funds had not been available, but the Voights and the Benekers might not have constructed environmental eyes if there had been no cost-share assistance.

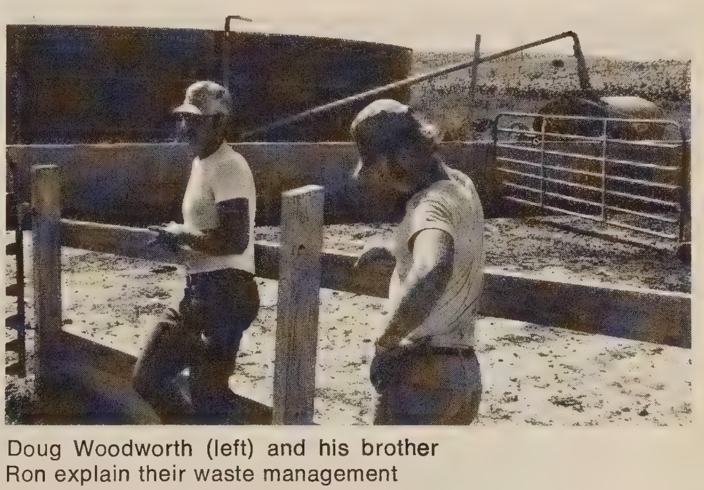
"Most farmers around here," said Harry Voights, "know that something has to be done about the waste problem. But it's difficult for a farmer, especially a struggling farmer, to set aside money for pollution control practices. The cost sharing helps a lot."

Considering that many farmers could install environmental eyes for only a few hundred dollars, the eyes may be an inexpensive part of the solution to a costly nonpoint pollution problem.

Mr. Foland is chief, conservation news & reports branch, SCS, Washington, D.C.



Far left, a retention dam on the Voights' farm not only traps barnyard waste but makes it easier to maintain the field road that runs below it as well. Left, a concrete "well" beside the Voights' retention dam skims the liquid waste for gravity transport to a holding pond.



Doug Woodworth (left) and his brother Ron explain their waste management system which includes a liquid manure holding tank (background) and a slurry spreader.

Looking for Trouble

by Roger Howell

Michigan conservation districts set goals, tackle their resource problems, and score.

In just 4 years, 15 erosion control structures were installed in one-fourth of the Newaygo Soil Conservation District (SCD) in Michigan—more than had been built in the entire district in the previous 25 years.

Frank Wentland, chairman of the Newaygo SCD, credits the district's success to its High Priority Goal Program. The program is a new approach to solving conservation problems. Through it, the district first identifies the most critical conservation problems and their locations and then concentrates all its available resources on solving them.

Instead of waiting for requests for technical assistance in problem areas, the Newaygo SCD now pinpoints conservation problems and offers landowners needed assistance. While the district concentrates on solving critical problems, it continues to provide everyday conservation assistance to farmers and other cooperators; but all promotional efforts are limited to high priority areas on high priority problems.

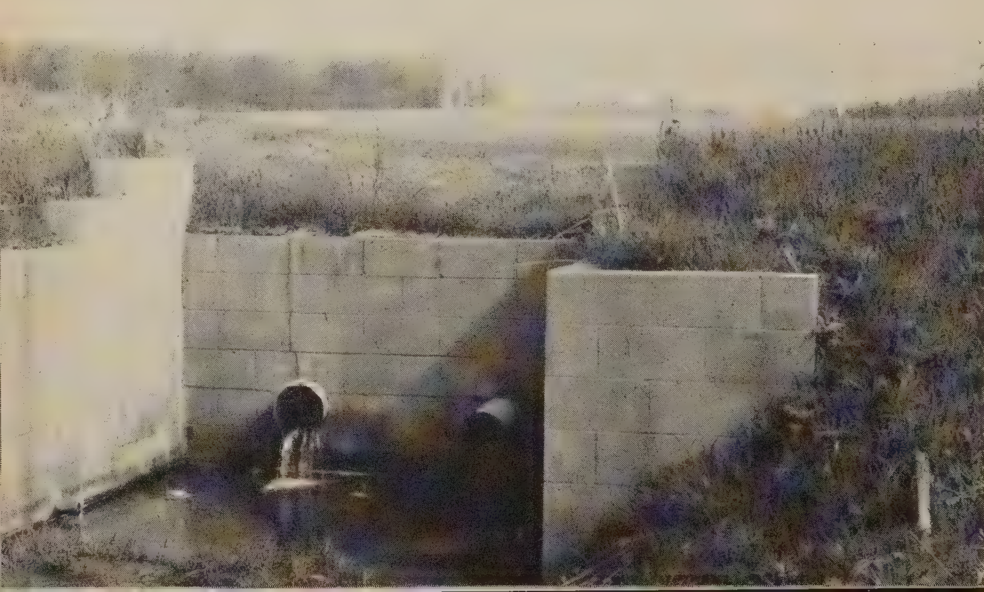
Soil Conservation Service District Conservationist Dick Rose, now Sauk Trails Resource Conservation and Development area coordinator in St. Joseph, Mich., helped the Newaygo SCD directors select the critical areas and set their conservation goals. The directors knew there were problems with erosion, flooding, unmanaged woodlands, and poor land use and that the problems existed in less than half of the district, but no one had ever really pinpointed them before.

Their first two top priority areas were easily determined—the Rogue River watershed project and a woodland management project. The SCD already supported and cosponsored the watershed project which is to reduce flooding in the district, and the manager of the district nursery just completed a study that identified areas needing reforestation and woodland management.

Another area they chose to concentrate on included public land and cash crops, fruit, and dairy farms in the vicinity of many lakes and streams. Land users in this area were having problems with water erosion so the district designated it for their erosion and sediment reduction objective. The directors also identified areas of the district that have light sandy soils that need protection from wind erosion.

The SCD directors then took a hard look at the problem areas they had identified to determine what conservation practices were needed. They set 5-year goals for each practice. The district directors asked SCS to concentrate on erosion control and soil protection in two of the high priority areas. They hired an information specialist to promote their reforestation and woodlot management objective and to carry out the district's conservation education program.

Some of the practices the Newaygo SCD set goals for included tree planting, critical area plantings, and grassed waterways. The 5-year goal for tree planting in high priority areas



After the Newaygo SCD adopted the High Priority Goal Program, it saw a dramatic increase in needed erosion control structures.

At right, SCS District Conservationist Glenn Lamberg (left) meets with Frank Wentland, chairman of the Newaygo SCD, to discuss what still needs to be done in the high priority areas.

was 1,000 acres. The district is 4 years into the program and has planted 906 acres of trees so far.

A goal for critical area plantings to reduce erosion and sedimentation was 290 acres. The district has already exceeded that by 2 acres.

In the high priority areas outlined for managing cropland for production with protection and erosion control, the district set a 5-year goal of 12 acres of grassed waterways. Nine acres have been installed and District Conservationist Glenn Lamberg is confident that the 12-acre goal will be reached or exceeded as scheduled this year.

The district has also continued to support and encourage completion of the Rogue River watershed project. Using Comprehensive Employment and Training Act funds, the district has a six-member crew to plant trees, thin and prune existing trees, work on streambank stabilization, and seed roadsides.

"The conservation work we are doing now is more visible because we are addressing known problems," said Newaygo SCD board member Pete Smalligan. "People are more aware of conservation work now and the district is better known."

The high priority concept used by the Newaygo SCD is being used by the other Michigan SCD's.

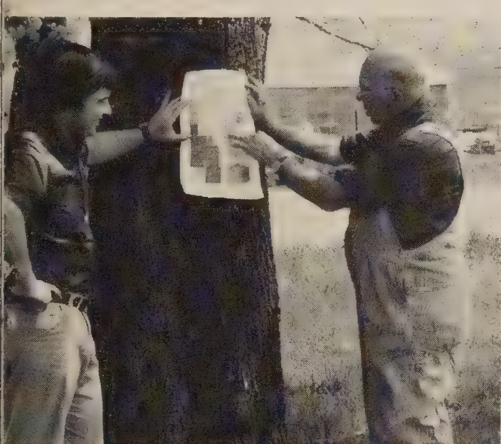
Julius Kolarik, chairman of the Leelanau SCD, said, "The High Priority Goal Program has helped Leelanau County use its resources more efficiently and effectively to solve the most severe erosion problems in the county. The reason it worked so well is that we have been able to concentrate our efforts in areas with severe conservation problems without neglecting isolated problems in other areas."

"The high priority goal concept is working well for us," said Elmer Schmuckal, chairman of the Grand Traverse SCD. "Windbreaks, stripcropping, and other needed conservation practices are being applied on land I didn't think would ever be treated."

When asked how the high priority method works in the Washtenaw SCD, Chairman William Fishbeck said, "Frankly, it has worked much better than we thought it would. Most people have priorities in their own lives and they understand that organizations have to function that way too. In fact, they expect us to, because they want us to do the urgent work that needs to be done."

SCS in Michigan is convinced that a high priority program that identifies problem areas and their conservation needs is effective. "We are having a greater impact on critical conservation problems," said SCS State Conservationist Arthur H. Cratty. "Accomplishments of the Newaygo SCD and other districts in Michigan prove that the high priority concept works."

Mr. Howell is public information officer, SCS, East Lansing, Mich.



Nursery Manager Arvid Shue checks Norway poplar cuttings. When rooted, the trees will be used to establish windbreaks in areas subject to wind erosion.

Putting Up a Good Fight

by Donald Click

Critical soil erosion is no match for the Ninety Six District.

Two centuries ago, the area in South Carolina now making up the Ninety Six District Resource Conservation and Development (RC&D) Area became famous. The first land battle of the American Revolutionary War took place there. But people in Greenwood County and in the five surrounding counties will tell you that the land battle still goes on today—only the adversaries have changed.

Now the local people are fighting soil erosion instead of British troops, and instead of the Continental Army, dedicated conservationists are helping them in the fight.

They are battling critical soil erosion with financial and technical assistance from the Soil Conservation Service through the RC&D program and with help from local soil and water conservation districts and local and State units of government.

On his farm near Ware Shoals in Abbeville County, Bud Brown healed 12 acres of severely gullied timberland. It took two bulldozers 2 weeks to smooth the land. The Ninety Six District RC&D Area provided the funds for seed, lime, fertilizer, and straw mulch for planting the barren land to grasses and legumes. Lovegrass was planted for temporary cover and sericea lespedeza for more permanent protection. Loblolly pine seedlings were also planted.

To control roadside erosion, the South Carolina Highway Department is sloping roadbanks and using a hydroseeder to apply a mixture of lovegrass, sericea lespedeza, and mulch. This critical area treatment makes roads safer by preventing sediment from running off and clogging roads and ditches. It also makes roadsides easier to maintain.

According to the chairman of the Ninety Six District RC&D Area Commission, M. J. Rhodes, one of the best examples of people working together through RC&D is an improved road in Edgefield County. After a heavy rain shower, the school bus couldn't make it through because sediment had clogged the roadside ditches and the water was too deep in the road. "When the county road supervisor visited the site, he said that he would have equipment there the next day," said Rhodes. "The roadbanks and rights-of-way were reshaped and smoothed, and RC&D funds were used to contract for the seeding."

Besides the critical area treatment applied to 650 acres in the Ninety Six District through RC&D, the people in the area are preserving historical sites, controlling floods, and participating in conservation education.

There is still much to be done. But folks in the Ninety Six District are proud of what they have accomplished through RC&D assistance in the last 3 years.

Mr. Click is resource conservationist, SCS, Anderson, S.C.

Eroding fields like this one (top) in Laurens County are a major cause of downstream sediment damage. SCS District Conservationist J. W. Black (bottom) examines area after grasses and legumes were planted. There is good cover even after a severe winter and a hot, dry summer.

Christmas Trees Trim Erosion

by Frank Jeter

For many people, Christmas trees bring to mind mistletoe and holly, brightly wrapped packages, and caroling. For Christmas tree farmers in the mountains of North Carolina and elsewhere, growing and harvesting the trees is a thriving business.

In North Carolina alone, more than a million trees were marketed in the 1977 holiday season. The number is expected to increase in 1978, according to the president of the North Carolina Christmas Tree Association, Hal Johnson.

Julian Benfield, a tree farmer in Avery County, N.C., runs a nursery on 30 acres on a steep hillside. The 20 acres he has in Christmas trees are planted only to Fraser fir. "Folks want the best when planning a joyous holiday," Benfield said. He must be right, because he sells every tree that grows to a marketable size.

More than half of the trees he sells will be sold for transplanting. Instead of being cut, the trees are sold with a ball of earth around the roots which is wrapped in burlap. People from as far away as Philadelphia, New York, and New England buy trees from Benfield.

But besides their part in holiday festivities and the income they bring to farmers, Christmas trees are also helping keep the soil in place on steep mountain slopes.

No ground is left bare on Benfield's steeply sloping nursery. A thick turf of grass grows between the rows of trees, protecting the fragile topsoil.

"With this sloping land, if you don't protect it, one good rain could strip it," Benfield said. For technical help with his conservation work, he relies on the professional services of Soil Conservation Service District Conservationist Cam Wyatt.

Protecting the soil is so critical on the steep slopes that Benfield uses no chemicals to control weeds growing among his Fraser firs because the chemicals might kill the protective grass. Instead, he uses a power scythe, which looks like a chain saw but has rotating cutters, to control unwanted growth.

Benfield's conservation efforts are highly effective in protecting the soil, and his holiday trees are spectacular.

Mr. Jeter is public information officer, SCS, Raleigh, N.C.

SCS District Conservationist Cam Wyatt (left) and Julian Benfield, tree farmer, look over future Christmas trees grown on a steep hillside. Without protective cover, the hillside would quickly erode to bare stone. Benfield protects the hillsides in his nursery (bottom) with the trees themselves and with a thick cover of grass between the rows.

Research Roundup

Frost-Measuring Network Predicts Winter Flooding

Accurate winter flood forecasts may be facilitated in the near future through the use of a network of frost-measuring devices, reports USDA's Science and Education Administration (SEA).

Severe winter floods occur frequently throughout the Pacific Northwest, endangering life and property. Flooding is caused by water runoff when rain falls on snow or on bare, frozen ground.

Accurate flood forecasts would provide warning for people to evacuate danger areas or take other evasive actions. SEA researchers are working on a watershed model to incorporate frost measurements into runoff forecasts.

The model could use the depth of frost to determine how much moisture the soil will absorb. If the soil is frozen to a sufficient depth, no moisture is absorbed and all further precipitation will run off into streams. Rain on snow melts the snow and, with no infiltration into the soil, adds to the problem.

SEA Agricultural Engineer Clayton L. Hanson of Boise, Idaho, is using two devices to measure frost. The primary measurement tool is a soil moisture measuring system consisting of two parts: sensors and a measuring instrument. The system is installed during the summer. In winter months it tells if the ground is frozen to a depth of 30 centimeters (almost 1 foot) which is a solid freeze that will not thaw or absorb any more water.

If there is no moisture in the soil, the soil moisture system will perhaps falsely read that the ground is frozen so Hanson uses a backup device. This is a plastic tube containing a mixture of sand, water, and fluorescein dye. The tube is also implanted in the summer and pulled up in winter. The mixture inside the tube is green when not frozen and brown when frozen, reflecting the condition of the soil.

Both measuring devices are quite accurate and much easier to use than the previous frost-measuring technique. Before, people had to dig into the ground and report how deep it was frozen, a tough and miserable job.

The work was done at the Reynolds Creek Experimental Watershed in southwest Idaho where conditions are similar to those in Idaho, Nevada, and Oregon.

Natural Aid to Tree Growth

Scientists report that it may be possible to grow trees on former strip mine sites where nothing has grown for years. Naturally occurring fungi that increase the rooting of woody plant cuttings are being studied by USDA's Science and Education Administration (SEA).

The fungi are called mycorrhizae and they live in a symbiotic state in plant roots. It is abnormal for most plants not to have mycorrhizae.

In tests conducted on cuttings of bearberry and huckleberry—two popular native landscape plants that are difficult to propagate using normal rooting procedures—more cuttings developed more roots when the rooting medium was inoculated with mycorrhizae.

The increased number of roots increases the plant's nutrient uptake and enables it to become established in soils during the stressful period following transplant. It is also believed that the mycorrhizae produce many other growth benefits in plants well beyond the rooting stage.

"The discovery of this phenomenon could be a major breakthrough in ornamental horticulture," said Robert G. Linderman, SEA plant pathologist at Corvallis, Oreg., who is conducting the studies.

Although it is not known exactly how the mycorrhizae increase rooting, Linderman suspects that the fungi are producing some substances that create a chemical change in the cutting or the rooting environment. This change induces the plant to produce more roots than it normally would.

Future research will focus on understanding the biology behind the rooting enhancement and on determining whether the mycorrhizae rooting phenomenon also occurs in other plants. The ultimate goal is to use these beneficial fungi for practical application in horticulture.

Research Aimed at Restoring Mined Areas

Availability of adequate supplies of topsoil is a limiting factor for revegetation of some areas disturbed by surface mining in the western United States. A soil scientist with USDA's Science and Education Administration (SEA) reports that good quality subsoil mixed with topsoil provides a good growing medium for plants on mined areas. The practice also increases the depth of material that can be spread over mined areas after coal or uranium have been removed.

"Studies show that 25 percent of the specific subsoil we used in the research can be used along with topsoil without any detrimental effects to plant establishment and production," said Gerald E. Schuman, SEA soil scientist.

Because the native soils are generally low in plant nutrients, fertilization is necessary for seedling growth and adequate production but at rates not considered prohibitively expensive—about 60 pounds each of nitrogen and phosphorus per acre.

In many cases, the mixtures of soils improved both chemical and physical properties of topsoil. Many native soils have limited water storage capacity and by adding subsoil material with higher clay content, more water can be retained for plant use.

Schuman's studies are continuing at SEA's High Plains Grasslands Research Station, Cheyenne, Wyo., and at three mine sites in eastern Wyoming.

Meetings:

December

3–6	American Society of Farm Managers and Rural Appraisers, Inc., New Orleans, La.
3–8	Joint Meeting of the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America, Chicago, Ill.
4–8	American Geophysical Union, San Francisco, Calif.
5–7	Western Forestry and Conservation Association, Sacramento, Calif.
6–8	Keep America Beautiful, Inc., Washington, D.C.
11–13	National Symposium on Strategies for Protection and Management of Floodplain Wetlands and Other Riparian Ecosystems, Atlanta, Ga.

January

3–8	American Association for the Advancement of Science, Houston, Tex.
8–12	North American Game Breeders and Shooting Preserve Association, Kansas City, Mo.
9–11	National Council of Farmer Cooperatives, Las Vegas, Nev.
14–18	American Farm Bureau Federation, Miami Beach, Fla.
22–26	National Cattlemen's Association Convention and Trade Show, Houston, Tex.
28–31	National Wool Growers Association and National Lamb Feeders Association Joint Convention, Las Vegas, Nev.

February

11–15	Society for Range Management, Casper, Wyo.
13–14	Southern Forest Institute, Inc., Houston, Tex.
13–16	Air Pollution Control Association, Gainesville, Fla.
13–17	Association of Interpretive Naturalists, Inc., Bloomington, Minn.
14–17	American Association of School Administrators, New Orleans, La.
14–17	Land Improvement Contractors of America, Nashville, Tenn.
19–24	American Camping Association, Minneapolis, Minn.

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Soil Conservation

January 1979

U.S. Department of Agriculture

From the Administrator

To Change the Land-Use Collision Course with Disaster

An empty, long-unused silo left standing in the parking lot of a Wisconsin shopping center towers above the low-rise storefronts in mute testimony to the land's former use.

No State is immune to the incredible pressures on rural land. Since 1968 alone, SCS estimates that Americans have converted the equivalent of the State of Louisiana—about 29 million rural acres—to shopping centers, housing areas, roads, airports, lakes, and other nonagricultural uses.

By the year 2000, at the current rate, we will have converted the equivalent of the State of Oregon—an additional 60 million acres of such land—to meet the needs of population growth.

Much of the land so converted is prime farmland, and many of the conversions are essentially irreversible.

Agriculture Secretary Bob Bergland calls this conversion of our farmland "a collision course with disaster" in our future ability to produce sufficient food and fiber to sustain our standard of living.

The Department of Agriculture's present land-use policy, signed by the Secretary on October 30, 1978, reflects the Secretary's and the Administration's concern with the land-use issue. A pattern of development that recognizes the importance of retaining agricultural lands is the main objective of the policy.

SCS and other USDA agencies are stepping up assistance to local residents and local agencies in their efforts to retain important farmland, forestland, rangeland, and wetland and to avoid encroachment on flood plains.

The Department will be guided by this policy in its own programs and during its reviews and comments on draft environmental impact statements, rules and regulations, and program proposals of other Federal agencies.

As important farmland retention rises on the list of State and local government priorities, SCS and conservation districts increasingly will be called upon to suggest reasonable and practical alternatives to reducing the remaining supply of these important lands.

If we are to cope successfully with today's serious challenges to the retention and conservation of the renewable natural resource base, SCS and conservation districts will need to strengthen and broaden our historic partnership for conservation.

Our task, a formidable one, is to encourage land users and governments to consider all the alternatives and to opt for the long-range view toward preserving our land resources.

When we are able to speak with a single voice, we will increase our chances of being heard and heeded.

Mel Davis

January 1979, Vol. 44, No. 6

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Bob Bergland
Secretary of Agriculture

Mel Davis, Administrator
Soil Conservation Service

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Soil Conservation

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Front cover:
A Washington, D.C., student hugs a plant which, along with other supplies, was awarded to his school for its progress in environmental education. See article on pages 12 and 13. (Photo, W. T. Webb, Jr.)

Back cover:
Using a stereoscope helps soil study workshop students understand how terrain and soil types affect sound land use decisions. See article on page 4. (Photo, Robert J. Brejcha.)

City Course in Soils Study

by Robert J. Brejcha

City dwellers take a mini-lesson in soils.

In many rapidly expanding urban areas, city parks are taking on new importance to people. Where formerly the parks offered a breathing space for city dwellers to get away from congestion, concrete, and busy streets, they now are often used as study areas, outdoor theaters, and sometimes for camping sites.

In Independence, Mo., the 70-acre George Owens Nature Park, dedicated a year ago, offered a program of 13 Saturday workshops last summer ranging from courses in astronomy to whittling and wood carving.

Each of the workshops is taught by volunteers from the community with Bruce Hickam, park supervisor, as program coordinator.

Among the Saturday workshops is a 4-hour mini-course entitled "Soils Study." Kathy Seddon, a soil conservation aid who is employed by the Jackson County Soil and Water Conservation District (SWCD) through the Comprehensive Employment and Training Act (CETA) program, is the volunteer instructor.

"Environmental education may be one of the district's most important missions," she said. "If we expect to assist with growing erosion-sedimentation problems and related water quality issues in the Kansas City area, we must instill a conservation attitude in the public mind."

Paul Hilpman, professor of geology at the University of Missouri at Kansas City, who is a member of the district board, helped Seddon develop the soils study course.

"Conservation education should be a part of the learning program in all schools from kindergarten through grade 12," Hilpman said. "The conservation ethic is not an inherent characteristic of people; it is a learned attitude. The George Owens Park workshop program is a good way to reach a large number of people."

Throughout the soils study course, Seddon emphasizes soil capabilities, land use choices, and conservation practices necessary for proper use of soil in providing food and fiber for people.

"Since the number of elementary schools in Jackson County runs into the hundreds, it is impossible for me to reach each of them individually. By working as a volunteer with the park workshop program, I can help the Jackson County district bring conservation understanding to those who truly want to learn," Seddon added.

Mr. Brejcha is resource conservationist, SCS, Independence, Mo.

Kathy Seddon (left), a soil conservation aid employed by the Jackson County Soil and Water Conservation District, uses soil maps to teach about land-use planning and conservation practices.

Winning Places

Every year the National Association of Conservation Districts and Allis-Chalmers sponsor the Environmental Conservation Education Awards Program. The two top conservation districts for 1978 are from Ohio and Washington.

A Place Where Everybody Learns

by Thomas W. Levermann

SCS District Conservationist Adrian Achtermann uses the Summit County Soil Survey to prepare Akron University graduate students to lead an intercollegiate geology field trip.

Precariously perched on a steep riverbank in Summit County, Ohio, eight graduate level geology students from the University of Akron and their instructor study gravelly soils exposed after a sudden and violent flood.

Deep in the woods at a YMCA camp, 25 sixth-graders, participating in a 2½-day resident outdoor education experience, discuss location, size, colors, and uses of plants.

At an elementary school, teachers identify the natural and human resources at the school and plan how to incorporate them into their emerging environmental education program.

These three seemingly unrelated events are all tied to the conservation education program of Ohio's Summit Soil and Water Conservation District (SWCD). For its outstanding achievements in conservation education, the district took first place in the 1978 National Association of Conservation Districts (NACD) and Allis-Chalmers Environmental Conservation Education Awards Program.

In serving the rapidly urbanizing greater Akron area, the district has a longstanding commitment to education. In the late 1940's, it organized its first conservation tour for ministers, and in 1950, the district began providing scholarships for students to attend the Ohio Forestry Association camp.

Tours and scholarships are still a part of the district's educational program. But to meet the increasing demand for environmental and conservation information, the district has broadened its educational efforts.

Jean Call, chairperson of the Summit SWCD, said, "In this highly urban area, we have found the potential for environmental conservation education unlimited. There is a great need and desire on the part of our citizens to learn about the environment and ways to protect it. Cooperating with the educational community provides us the oppor-

tunity to share the district's experience and expertise in soil and water conservation with literally thousands of people every year."

The district board receives program suggestions from its education committee. Composed of representatives from universities, schools, agencies, and the district board, the eight-member committee meets annually to review the community's environmental education needs and determine how the district can help meet those needs.

What has emerged is a program equally divided between higher education and secondary and primary education.

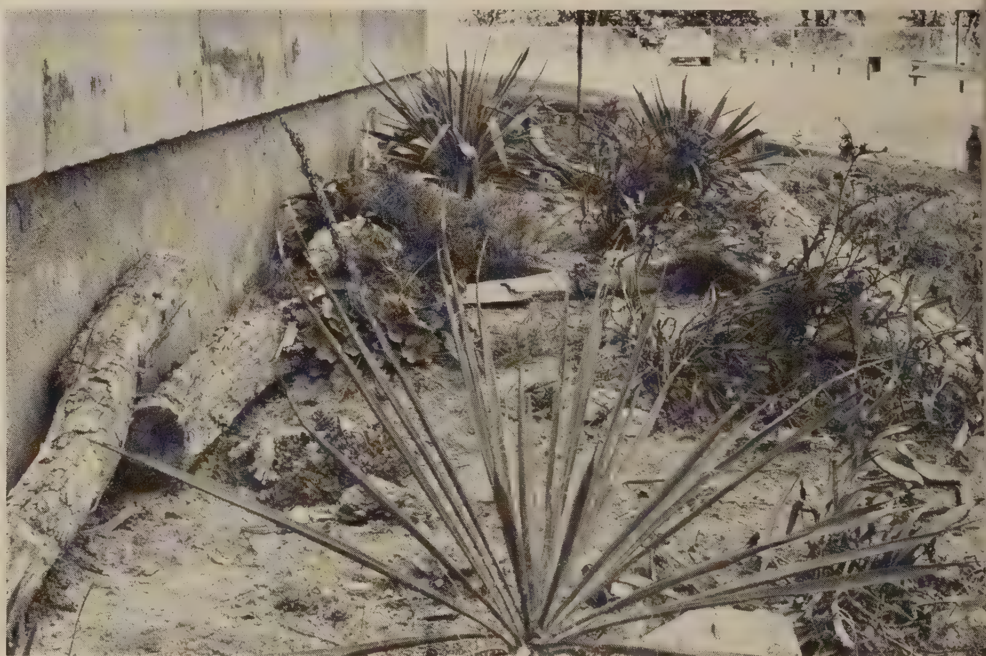
Both the University of Akron and Kent State University have called on the district board and staff to help with planning programs for and instructing several undergraduate and graduate natural resources and conservation classes. Through the contacts made with teachers, prospective teachers, and interested citizens at the programs, district personnel are being asked to help with educational programs throughout Summit County.

Also, as a result of the district's growing involvement with the community, requests for assistance in developing outdoor classrooms and arboretums on school grounds have increased. In addition, the district is being requested to solve erosion problems on school sites.

At McDowell Elementary School in Hudson, a team consisting of Principal Jim Staud, Soil Conservation Service District Conservationist Adrian Achtermann, Bob Mravetz

School's out! At Jennings School in Akron, two students on their way to the playground jog down steps placed on a slope that was eroding.

The school's conservation plan included controlling erosion on this hillside. Most of the plants used for protective cover are native to Ohio.



Students and teachers at Jennings School established an experimental planting area using desert plants. They selected plants adaptable to Ohio's climate.

Sixth grade students from Akron public schools attended an annual resident environmental education program. They learned about plants and their uses including how to identify plants by leaf shape, color, and size.

and Tom Adolph from the University of Akron, and several McDowell teachers is planning the restoration of a ½-acre pond adjacent to the school property. An interdisciplinary environmental education program will be developed using the resources found on the school property and around the pond.

Just a 5-minute walk from the school, a 30-acre forested area was purchased by the Hudson local school board to be used as an environmental education area for the entire school system. The conservation district helped the school board develop a learning trail through the woods.

All members of the McDowell planning committee have participated in the University of Akron's summer outdoor education program lead by Mravetz and Adolph.

In Akron, the Jennings Elementary School playground is about 40 feet lower than the school building. The steep slopes were eroding because of the thin vegetative covering and heavy student traffic on the hillsides. The district developed a conservation plan for the problem area which called for planting trees and shrubs, installing log steps, and developing a desert ecology area near the school building. Students and teachers obtained the necessary plant materials and went to work with much success.

Reflecting the prevailing attitude toward environmental education, Ronald "Oz" Hibbard, director of elementary education for Summit County schools, said, "The environment is such a natural motivator, everyone's positive about environmental education."

That attitude is apparent throughout the county. The Akron school system has assigned three teachers to work full time with its resident environmental education program, now in its 13th year. Annually, each of the approximately 3,000 sixth-grade students in the Akron public schools will spend 2 to 4 days at camp during the school year—from late September until early the following May.

High school students, many of whom participated in the camping program when they were in sixth grade, serve as counselors and program facilitators. Conservation district staff lead soils investigations, describe environmental relationships, and discuss the role of soil conservation in environmental management.

"In an urban area, large numbers of people are directly and indirectly influenced by educational programs," said Jean Call. "As a conservation district, we have the resources to bring people together. And we have done that. We also have the resources to provide the direct personal assistance to all levels of education. And we are doing that." The results have been dramatic.

Ten schools are in the final stages of developing conservation plans for their outdoor classrooms. In preparation for leading the 28th Annual Ohio Intercollegiate Geology Field Trip, hosted by the Institute of Environmental Studies at the University of Akron, Adrian Achtermann instructed graduate-level geology students about the characteristics of Summit County soils.

Alys Briers, Ohio State winner of the 1978 NACD and Allis-Chalmers Conservation Teacher-of-the-Year Award, used the resources of the district to help organize and operate a resident environmental education experience for fifth graders from F. H. Bode Elementary School.

Principal Charles Rodefer enthusiastically supported Briers. "There are many benefits of this type program, not the least of which are that the students see their teachers as human beings. From that, a close and meaningful relationship develops," said Rodefer. "The camp even helped with a severe discipline problem we were having with one student. After the resident camp experience, this particular student was much better behaved. Back in the classroom we would share common experiences which brought us together as individuals."

The district has become a fully active partner in environmental education in Summit County. "People are asking for our assistance, and we will continue to serve them," said Call.

The challenge for the district and educators in Summit County is well stated by Oz Hibbard. "What our children do with the environment when they are running the country will depend on what we, as educators and conservationists, do today."

Mr. Levermann is educational relations specialist, Information Division, SCS, Washington, D.C.

A Plan for All Ages

by Kay Mergen

SCS Soil Conservationist Ric Zarwell introduces sixth graders to wildlife studies during a week-long environmental education program at Camp Wooten.

Walla Walla County Conservation District's education program is a winner. It won second place in the Environmental Education Awards Program sponsored annually by the National Association of Conservation Districts and Allis-Chalmers.

The district, located in southeast Washington State, planned a broad range of activities for adults, students at all grade levels, and youth groups. Recognizing education as a life-long, continuing process, the district emphasized diversity in the program to meet many different needs in helping people understand and cope with conservation issues.

The conservation district's education committee includes Jackie Ormsby, curriculum director, and Elton Fenno, curriculum coordinator, for Walla Walla School District; Kenneth Knowles, chairperson of the conservation district board and a farmer; Jack Winchell, National Park Service naturalist; Howard Willson, county extension agent; and Larry Hooker, district conservationist, and Ric Zarwell, soil conservationist, both with the Soil Conservation Service. Chairperson of the committee is Larry Hector, agronomist for a local corporate farm.

During a series of meetings with teachers and school administrators, education committee representatives helped establish goals and objectives for environmental studies.

In working with the environmental education program for county schools, the education committee contacted each school principal to offer help through the conservation district with outdoor classrooms and other environmental studies. In 1977, conservation plans for outdoor learning areas were prepared for nine schools.

To encourage teachers to make use of school sites and other local resources, one of the assigned projects in a graduate level credit course for inservice teachers was preparing individual study guides

and lesson plans that could be used by all teachers in the school district.

The lesson plans were then published by the Walla Walla School District Curriculum Office in two booklets titled "Outdoor/Environmental Education Teachers Guide and Lesson Plans." One of the books covered kindergarten through sixth grade and the other, grades 7 through 12. Ric Zarwell served as coordinator.

Each of the lesson plans identifies learning objectives, outlines suggested activities, and includes possible followup studies, supplementary reading, sources of community help, and lists of films and slides. Areas of study are science, social studies, language arts and creative writing, mathematics, and ecology.

The conservation district, through the education committee, provided materials and other help to fifth grade students from Walla Walla County, Wash., and Umatilla County, Oreg., who took part in a 2-day Weston Mountain School forestry tour. Instructors for the eight learning stations included representatives of the Oregon Department of Forestry, Extension Service, Boise Cascade Corporation, Washington State Game Management Department, USDA's Forest Service and SCS, and operators of privately owned Christmas tree farms.

Sixth grade students from 11 different schools in Walla Walla County each year spend a week at Camp Wooten, 70 miles east of Walla Walla on the Tucannon River. The camp is sponsored by the school district.

Elton Fenno is one of the directors of the camp. He remarked that the week at camp is "probably the first time in the lives of some of these youngsters that they have been away from TV, radio, the refrigerator, gum, and candy."

Study projects include learning about trees and other plants, wildlife and its place in the environment, and the impact of people on natural resources.

Art classes emphasize student perception of shapes, colors, and textures in nature as they relate to various art forms. Soil studies are directed by a retired SCS conservationist, Evard Harrison, and his wife. A soil pit on the learning trail gives students a look at soil horizons and each student creates a miniature soil profile in a clear plastic tube.

Conservation district activities with adult groups are carried on in cooperation with many agencies and are geared to bringing a broader understanding of conservation to all citizens.

For example, a County Range Tour sponsored by the conservation district, USDA's Extension Service (now Science and Education Administration), and Walla Walla Chamber of Commerce, featured a look at the deer and bear management programs of the State Game Department; it also included a discussion of proposed wilderness areas in the Umatilla National Forest.

A "meeting of the minds" session, arranged by the conservation district, was attended by county landowners and representatives of the U.S. Army Corps of Engineers to discuss several issues related to the Snake River drainage area.

Ric Zarwell, representing the conservation district, is serving as chairperson of an ad hoc committee to develop 103 acres of historic Fort Walla Walla Park as a nature and learning area for the community. Also on the committee are representatives of the National Park Service, USDA's Forest Service, the local school district, Blue Mountain Audubon Society, U.S. Army Corps of Engineers, Walla Walla Historical Society, Whitman College, and the City Parks Department. The fort dates back to 1857 when Marcus Whitman and other pioneers were traveling through the area.

District activities also included assistance to the Inland Empire Natural Resources Youth Camp that enabled 10 high school age youths to attend the 1-week resource camp on Lake Coeur d'Alene in Idaho. High school classes in Walla Walla took part in soil investigation field trips and in woodland management studies. One class designed and worked on a nature trail at Kiwanis Camp in the Blue Mountains.

Also with the help of the conservation district, 70 Girl Scouts took part in two study sessions on water resources and aquatic life that included management of watersheds and water needs for people.

Ms. Mergen is head of educational relations, Information Division, SCS, Washington, D.C.

The Summit County Soil and Water Conservation District and the Walla Walla County Conservation District represent the North Central and Pacific National Association of Conservation Districts regions. Other regional district winners of the NACD and Allis-Chalmers Environmental Conservation Education Award are:

Northeastern—Monroe County Conservation District, Stroudsburg, Pa.

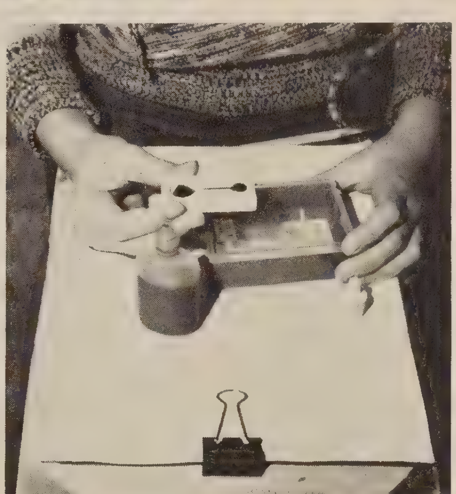
Southeastern—Lexington Soil and Water Conservation District, Lexington, S.C.

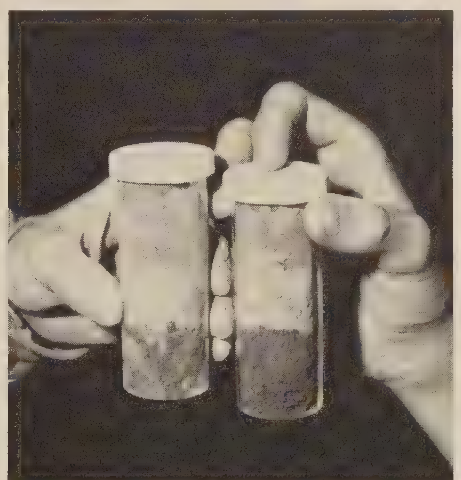
South Central—Crescent Soil and Water Conservation District, Metairie, La.

Northern Plains—Wyandotte County Conservation District, Kansas City, Kans.

Southwestern—Yuma Conservation District, Yuma, Colo.

Above, one of the student projects at Pioneer Junior High School included measuring the velocity of water flowing in a small stream on the school site. At right, soil studies at Camp Wooten give students an understanding of texture, color, and the techniques of testing for pH and other characteristics that determine soil potential for various uses.





Above, classes in water safety are part of the Camp Wooten program for sixth graders from Walla Walla schools.

At left, each student puts together a miniature soil profile as part of the soil study activities.

Long-Range View of Learning

by Sylvia K. Shugrue

More important than blue ribbons in outdoor education programs are the skills, attitudes, and understanding that students gain in managing their environment.

Developing outdoor classrooms for several schools in an area is a challenge. It takes dedication and effort. It demands the ability to respond positively to changing situations.

Many changes have taken place in environmental education programs in Washington, D.C., schools over the last 20 years. But some aspects common to all District schools' outdoor projects can be used as guides in maintaining an environmental education program for children everywhere.

Vital to the continuity of any program are adult leaders committed to the use of school grounds as a place for children to learn about, manage, and appreciate their environment. They must be committed to providing children the opportunity to experience planting a garden, a shrub, or a tree and watching it grow; or shaping, liming, and seeding an eroded area and watching plants spread a protective cover over it.

In the District, program leaders usually come from outside the school system. They are parents; educators from all levels of teaching; and representatives of Federal resource agencies, the D.C. government, and conservation organizations.

District schools range from those having large sites available for a variety of conservation activities to others with very little soil for planting. At the 105-year-old Stevens Elementary School in commercial downtown Washington, sidewalk bricks had to be removed to make room for planting areas.

Another District school, Francis Scott Key Elementary, maintained an outdoor classroom for about 15 years. The program was started as a science project, with teachers, a science coordinator, and volunteers from the Soil Conservation Society of America (SCSA) developing outdoor activities such as soil studies and planting projects for students.

In 1972, Soil Conservation Service District Conservationist Ernest Moody prepared a 3-year conservation plan to be developed by the children at Francis Scott Key with the help of teachers, maintenance personnel, interested parents, and other volunteers.

Some staff members of the U.S. Geological Survey (USGS) were so impressed by the quality of work done by the students at the school that they started a mapping program for them. The school site was well suited for teaching skills and concepts of topographical mapping. USGS also worked with teachers on testing earth science curriculums the agency had developed.

The school was featured as a model project in a series of articles in *Science and Children* magazine and presented in programs at two national conventions of the National Science Teachers Association.

New and different learning experiences must be planned year by year as an environmental education program develops. Photographs taken over the years can show the transformation of a school site, but to students who look at them every day, shrubs planted in 1973, for example, are taken for granted by 1979; a hillside reclaimed from erosion and no longer scarred seems to have always been covered with

Ernest Moody, SCS district conservationist for the District of Columbia, helps children make a study of soils on the school yard.

Photo by W. T. Webb, Jr.

grasses and other vegetation.

Children learn to respect the environment through managing a bit of it on the school site. A student at Eaton School in center city Washington said, "Now that I know the problems of soil erosion and how to solve some of them, it will be hard to look at soil being washed away without thinking about it twice."

As an incentive to further conservation work at school sites the Washington Chapter of SCSA established the Thomas L. Ayers Outdoor Classroom Award, in memory of a dedicated SCSA volunteer who spent many hours working with District teachers and students.

To be eligible for the noncompetitive award, a District school must have had an environmental education program for at least 1 year and have made some progress in conservation work. Last spring, SCSA recognized 11 schools for their outdoor education efforts. Awards consist of supplies such as shovels, seed, or shrubs that program leaders, school personnel, and students decide they will need after they evaluate their plans for future projects.

Today, at schools throughout Washington, D.C., conservation learning goes on. Some schools have completed their original conservation plan, changed instructional emphasis, and now leave outdoor classroom maintenance to the custodial staff. Others continue the never-ending task of conserving, maintaining, restoring, and beautifying their school grounds with the help of the district conservationist and other resource people.

To expect a program or a model project to remain at its peak is to deny that change—in the learning process as well as in nature—is the only constant. As school administrators, teachers, and students move from school to school, program emphasis and interests inevitably will change. Last year's vibrant environmental education program may be virtually nonexistent this year.

Program leaders must not be discouraged by these changes. Success should not be measured by accomplishments at one school alone but by the continuing and expanding environmental education program which extends to many schools and the educational objectives accomplished and skills acquired by students. Leaders need to keep the spirit of outdoor education alive and moving from school to school.

In the District, an inactive program is not regarded as a failure but as another challenge—a challenge to return to that school again, to motivate new teachers and new students.

Program leaders should not look only to the exemplary projects for inspiration. Instead, they can learn from a student at Walker-Jones School, who, after working a year to revegetate an area compacted by the tracking of many little feet, said, "A plant cannot move from place to place. It must stand and meet its enemy face to face."

Ms. Shugrue was a science resource teacher with Washington, D.C., public schools and is now retired. She is also a former president of the National Science Teachers Association.

Conservation Planning with Class

by William W. McCartney
and Jane Johnson

Farmers get credit for do-it-yourself conservation planning.

Directors of the Adams and Pike Counties Soil and Water Conservation Districts (SWCD's) in west-central Illinois have found a way to provide conservation planning assistance more effectively to more people in less time.

In cooperation with John Wood Community College in Quincy, Ill., and the Two Rivers Resource Conservation and Development (RC&D) Area Council, a conservation planning course was developed and offered through their Outreach Program at Pittsfield and Quincy.

Of the 46 class members in the first class, 37 are active farmers. These farmers form the nucleus of mutual interest groups in Adams and Pike Counties. "The participants want practical information they can take home and apply in their own operation," said Kurt Bobsin, district forester, Illinois Department of Conservation.

The course objective is to accelerate conservation planning in the Two Rivers RC&D Area. The students become involved in the planning process by actually developing a conservation plan on their own land. This gives them a working knowledge of conservation planning and leads to resource management systems being applied on the land in an orderly manner.

The instructional method is an innovative course feature. Instructors are local, State, and Federal agency representatives who are experts in various aspects of the conservation planning process. Twelve guest instructors are cooperating to make the conservation planning course informative and practical. They are enthusiastic about this approach because in a 3-hour period they can provide the course participants with indepth information on conservation practices.

Class lectures include presentations on: history of the conservation movement, explanation of soil and water conservation districts, soil formation, soil fertility, woodland management, fish management and water quality, Universal Soil Loss Equation, and what a conservation plan is. Also, soil and water conservation practices (mechanical and cultural), wildlife management, livestock waste management, financing conservation plans, and 208 water quality management are discussed. In addition, two laboratory sessions are held for students to develop conservation plans.

In support of classroom presentations the Soil Conservation Service

To augment the classroom presentations, SCS district conservationists make personal visits to students' farms and assist them with conservation planning.

district conservationists in Adams and Pike Counties assist participants in preparing their conservation plans by making personal farm visits.

Wayne Kinney, district conservationist in Pike County, said, "We are helping class members obtain all the information they will need to prepare their own conservation plans. And, at the same time, the class members gain a real appreciation of the complexity of the conservation planning process."

An added bonus is the 3 hours of credit that the class participants receive toward an associate degree in agriculture from the John Wood Community College.

The most common approach used in working with mutual interest groups is to hold four sessions of 3 to 4 hours each in which several subjects are discussed. A 15-week course gives instructors the opportunity to go a little deeper into each subject and provide more information to the landowners, enabling them to make decisions on how their land should be used.

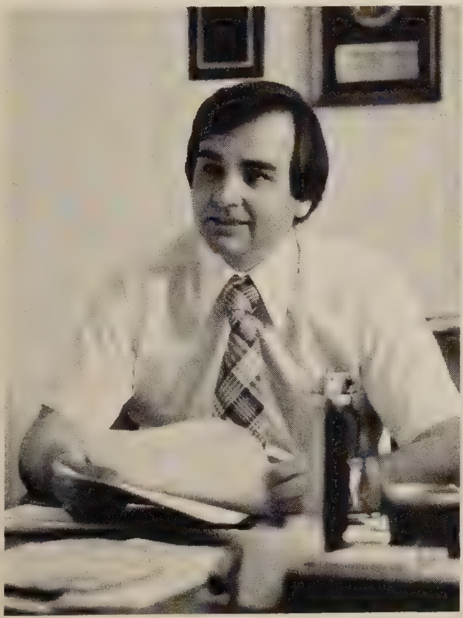
Larry Fischer, coordinator of the agriculture curriculum for the college, was very receptive to this concept and worked to get the course offered for the fall semester.

Is the Conservation Planning Course an idea ahead of its time? "Apparently not," said Fischer, "The 46 students enrolled in the two locations make these classes some of John Wood Community College's most successful. The students enrolled have diverse backgrounds. More than 70 percent are farmers and the other 30 percent consist of high school and college students."

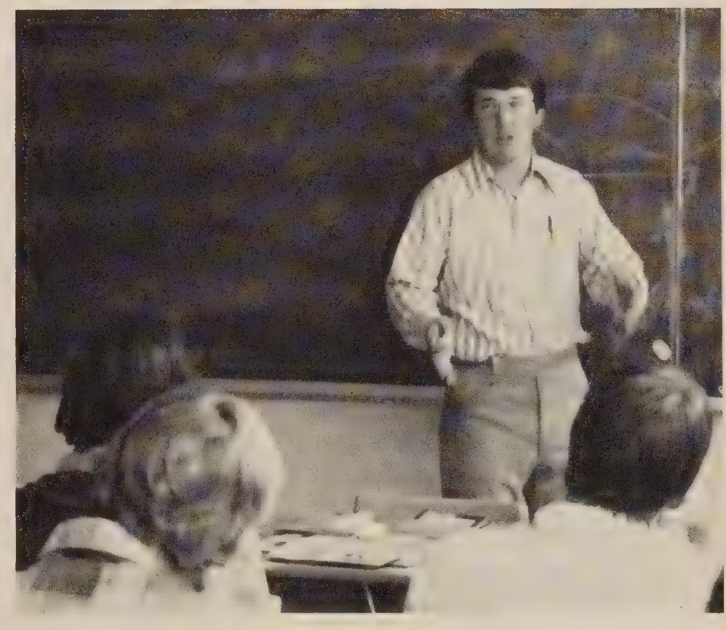
Fischer feels the support of the Adams and Pike SWCD's has greatly contributed to the course's success. Not only have the district chairpersons served as instructors, but they actively recruited participants for the classes.

Louis Reuschel, Adams County SWCD chairperson, explained, "The course is one way of accelerating planning and application of resource management systems for viable land treatment."

Mr. McCartney is RC&D coordinator, SCS, Pittsfield, Ill.
Ms. Johnson is environmental education coordinator, Pittsfield, Ill.



At left, Larry Fischer, agriculture curriculum coordinator, was instrumental in getting the conservation planning course offered at John Wood Community College.



At right, in addition to other topics, instructors lecture on various soil and water conservation practices such as parallel tile outlet terrace systems and grassed waterways.

A Teaching Resource for Resource Teachers

by Karl Hellerick

Teachers in Lebanon County, Pa., get all the latest news on conservation education thanks to a monthly newsletter the conservation district puts out especially for them.

Clair Gerberich, Lebanon Conservation District executive assistant, launched the first issue of Conservation of Resources and Environmental Education Learning, or CREEL, in March 1977, and it has been smooth sailing for the newsletter ever since.

Published nine times a year, CREEL provides teachers with resource information and tells them about the many ways the district can help them develop for their students valuable learning experiences in resource conservation both in and outside the classroom.

In the newsletter, the district offers teachers suggestions for conservation education activities, such as having students make wall murals or a frieze on fossil fuels and using a "talking" tree limb in teaching young students about the growth of a tree.

The newsletter also tells teachers about interesting field trips they can take with their students to learn about managing resources wisely. It tells about qualified people available to speak to teachers about conservation education and to talk with students about resource conservation in their classrooms or on field trips.

Information on where and how to secure conservation education aids such as films, energy conservation brochures, and soil and water conservation bulletins is listed in the newsletter.

The Lebanon Conservation District knows that variety is important in maintaining young people's interest in learning. CREEL covers a variety of conservation education topics: protecting forests through proper tree harvesting and wise use of timber; the care, selection, and history of the Christmas tree; the habitat needs of white-tailed deer; surveying on the contour; and others.

Through CREEL—the Lebanon County Conservation District's conservation education newsletter—Clair Gerberich, the district's executive assistant, receives requests from many teachers to bring conservation into the county's schools.

The district eliminates postage expense for CREEL by taking bundles of the newsletter to each school district which then distributes them to the schools where each teacher receives a copy.

The newsletter is less than 2 years old, but the conservation district has received many favorable comments from teachers and students alike about it and the learning activities it has generated. One teacher wrote, "Your newsletter has been most useful to me, both personally and in my teaching."

After Gerberich had made a presentation on soil conservation to a fourth grade class, one student wrote, "You were better than watching television."

Following a classroom demonstration by Gerberich on surveying, another student wrote, "Surveying is when two men are out on a hill and get even with each other."

"Environmental education is something that people need to know about," said Gerberich. "We feel the CREEL newsletter is an effective tool for reaching them."

The Lebanon Conservation District is succeeding with its newsletter and in the many other ways it promotes conservation education in the county. In 1977, it won the Northeast Regional National Association of Conservation Districts and Allis-Chalmers Environmental Conservation Education Award.

Mr. Hellerick is district conservationist, SCS, Lebanon, Pa.

Three Wheeling Through Texas

by Eual G. Davis

Three-wheelers pick up where pickups bog down in designing terrace systems on the Texas High Plains.

Soil Conservation Service personnel at Tahoka, Tex., are saving time, money, and fuel by using an all-terrain vehicle and walkie-talkie radios to plan and design parallel terraces.

Farmers on the Texas High Plains use the all-terrain or three-wheeled vehicles for many farm jobs. SCS technicians who saw the vehicles at work recognized the advantages of using them to install conservation measures.

The Lynn County Soil and Water Conservation District (SWCD) board of directors decided to buy one all-terrain vehicle and a pair of walkie-talkies to help speed up service to district cooperators.

Every year for the past 12 years, SCS personnel working through the district have helped farmers in Lynn County install more than 190 miles of parallel terraces. Terrace systems require a tremendous amount of time to design, stake, lay out, and check because they must be built an even number of rows, and tractor trips, apart from end-to-end.

In planning a terrace system, a grid map is made of the field and elevation readings are taken every 100 feet in each direction. With this information, the design can be simplified and the system installed with the fewest cuts and fills, reducing the installation cost.

For years, SCS personnel used pickup trucks to drive over the fields to prepare grid maps. Vehicle maintenance and repair costs were high because of the many miles of hard driving. In addition, some of the fields in Lynn County are so sandy that pickups cannot travel across them when the soil is dry; they bog down. That meant that mappers had to get around the fields on foot, which takes a lot of time.

The all-terrain vehicles allow mappers to travel over sandy soils or plowed fields much faster and more economically than they could by walking or using a pickup. The wide balloon tires easily ride over plowed fields.

Walkie-talkies are used by the surveyors when making topographical maps. The person at the surveying instrument still uses a flag to tell the other person when to raise or lower the target, but they use the walkie-talkies when a question arises that can only be answered through direct communication. When SCS personnel are working 80- to 640-acre fields, the walkie-talkies save them a lot of time.

Records are being kept to see how much time and money are being saved with the three-wheelers and walkie-talkies. It takes about 16 hours to make a grid map and lay out a mile of parallel terraces on foot, about 13 hours by pickup, and only 9 hours using the three-wheelers and walkie-talkies. The savings in fuel and vehicle maintenance are even greater. The directors of the Lynn County SWCD are pleased with the results.

Mr. Davis is district conservationist, SCS, Tahoka, Tex.

SCS Conservation Technician Don Tumlinson, on the three-wheeler, and Soil Conservationist David Brinegar, at instrument, take readings in a field. Use of three-wheelers and walkie-talkies saves time and money in designing parallel terraces.

Dairyland Interest in the Water Bank

by Steve Foland

Wildlife gain from high interest in the water bank program.

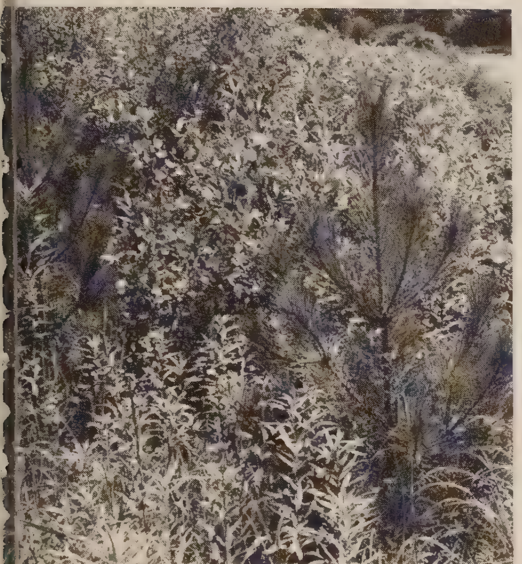
An excellent stand of bromegrass and reed canarygrass provides cover for wildlife around a water bank cost-shared pond.

"In Columbia County, Wis., the Water Bank Act is being used for much more than to maintain a few cattails," said Soil Conservation Service District Conservationist Irwin Ten Haken. "Land owners and operators in the county who participate in the program are serious about preserving, restoring, and enhancing wetland for use as wildlife habitat. They are especially serious about attracting such migratory birds as teal and mallard ducks."

John and Jayne Clemmons' 103-acre farm in Fort Winnebago Township is a good example. When the Clemmons bought the farm in 1973, much of the land was being used for growing corn. During the first 2 years they owned the farm, the Clemmons leased the land to individuals who continued farming it.

The severe hazard of flooding on the farm made crop production a risky business. "Anyone who planted a crop on it was relying on sheer luck," said John Clemmons. "That's why I went to the local soil and water conservation district for help. I wanted a plan for ditching and draining the land."

Ten Haken and others at the district office studied the farm and determined that it had just the right combination of wetland and dry soils to make it eligible for the water bank program. The farm had a substantial amount of Type III wetland—having water on or near the surface and supporting cattails and reeds; Type IV wetland—having surface water 6 inches to 3 feet or more deep; and Type V wetland—having surface water up to, or a little less than, 10 feet deep. The farm also



The nearly 5,000 spruce and pine trees planted by the Clemmons will soon provide cover for wildlife and enhance the beauty of the farm.

had a substantial area of soils that could support grasses suitable for wildlife habitat.

"It was an ideal situation," said Ten Haken. "If the dry areas were no longer farmed and were planted to bromegrass, timothy, switchgrass, and other suitable grasses, waterfowl could nest in the grasses and use the wetland as a brood area. The brood area could provide excellent food and cover."

Ten Haken presented the Clemmons with alternatives to draining the land and explained the Water Bank Act of 1970 to them. "The land had been over-farmed for years," said Jayne. "It had only been taken from. We liked the idea of putting something back into the land and helping wildlife. Our only concern was that we would have to open the land to hunters. But Mr. Ten Haken assured us that under the water bank program we could post the land to prevent hunting without permission and thus control the wildlife population."

The Clemmons had already installed one wildlife pond on their farm near Neenah Creek. The pond and the creek supported some wildlife, but, as John said, "It didn't make us feel very good to learn from Mr. Ten Haken that we had also been plowing through waterfowl nesting ground."

The Clemmons decided that their land should be used as wildlife habitat, and signed a 10-year water bank agreement in 1976. Ten Haken prepared a conservation plan for the farm and staked out 68 acres as the water bank area. The plan called for a second wildlife pond to be constructed and for extensive seeding to selected grasses.

"To construct the pond," said Ten Haken, "we just scooped out a depression and let what had been underground water, or the water table, fill it up. The pond catches very little surface runoff water."

On the fringe of the pond, water bank cost sharing helped finance the seeding of an excellent stand of bromegrass and reed canarygrass for wildlife cover. An additional 28 acres not included in the water bank agreement is managed for wildlife production.

"The switchgrass, although somewhat difficult to establish," said Ten Haken, "is stiff stemmed and will remain as standing residue even after a winter of heavy snow. Waterfowl are very early nesters and switchgrass provides them plenty of early spring nesting material."

Approximately 5,000 pine and spruce trees had been randomly planted for wildlife cover prior to the water bank agreement. The trees will contribute to the beauty of the farm and will provide excellent cover for many types of wildlife. As Ten Haken said, "An important thing to remember is that, although the Water Bank Act is primarily for waterfowl habitat, many other forms of wildlife benefit from water bank areas."

To attract a variety of wildlife to their farm, the Clemmons retained all of the naturally growing wildlife habitat plants, such as the wild grapes that grow abundantly in some places on their land. Besides teal and mallard ducks, the farm attracts deer, raccoon, muskrat, grouse, and quail. The Clemmons had their property licensed as a game farm, and to date they have raised and released about 800 pheasants.

In managing the farm's game resources, the Clemmons allow fishing and some hunting, and John traps muskrat each year.

"It's sad," Jayne said, "that there are so few farms like ours. Animals need places like this. And people should have places like this to see, hear, and enjoy."

Mr. Foland is chief, conservation news & reports branch, SCS, Washington, D.C.

Telling Cattle Where to Graze

by Howard Harkey and Noel Marsh

Whether it is called "high intensity, low frequency," "short duration," or "nonselective" grazing, the system spells out increased forage production, reduced supplemental feeding, and higher beef production.

Sid Goodloe moved to Capitan, N. Mex., in 1956, a drought year. The ranch he bought had a spring where thousands of cattle from miles around had watered, consequently damaging the range. During his first year in Lincoln County, Sid learned that much of the moisture comes in the winter. Summers are often too dry to produce dependable amounts of blue grama on which to base a forage program.

Other immediate problems Sid found on the ranch were soil erosion; depleted vegetative cover; poor water distribution; brush invasion onto the deeper, high forage producing soils; and insufficient fencing.

In 1957, Sid became a cooperator with the Carrizozo Natural Resource Conservation District and the Soil Conservation Service. He began installing conservation practices which included erosion control structures, range seeding, livestock watering facilities, brush management, and fencing to divide the ranch into winter range and summer range for better livestock management.

The range seeding was needed to put back into production old fields where dryland farming had failed during the homestead era.

The invading juniper on Sid Goodloe's range is controlled by dozing, but the better nut or cordwood producing pinyon trees are left.

A spring development and watering trough help Goodloe distribute grazing.

Sid made good use of the Great Plains Conservation Program, administered by SCS, to accomplish much of the conservation work.

In 1971, Sid developed a ranch plan. The objective was to increase production on the ranch by 20 percent in 5 years, using a specialized grazing system.

"We hoped to double our population of western wheatgrass," said Sid. "Instead we tripled it. Production is probably up more than that."

Sid knows the value of cool-season forage for spring and fall grazing which reduces supplemental feed costs.

"My range is not dormant during late fall and early winter due to cool-season plants," explained Sid. "To develop an adequate population of cool-season grasses, selective grazing must be stopped.

"The best range management tool we have today is simple economics. When the cost of supplemental feed skyrockets, we are forced to grow more and better forage. That is when we learn the meaning of range management.

"The big gap in range management is between what is known and what is being done on the ground," Sid concluded.

After returning from Africa where he served as range advisor to the government of Kenya, Sid began crossfencing the ranch and rotating cattle.

During his 2½-year stay in Africa, Sid made several trips to Rhodesia where he learned about "nonselec-

tive" grazing. This system became the basis for Sid's current rotation program for both summer and winter range.

Sid's grazing system consists of stocking a pasture with a large number of animals for a short period of time and then deferring for a longer period. Although this Rhodesian system has been adopted by Texas A. & M. University as "high intensity, low frequency" and is known by others as "short duration," Sid prefers to use the original term, "nonselective" grazing.

"Basically, I try to concentrate my cattle in each pasture for a short period of time, requiring them to eat unpalatable as well as palatable forage, while at the same time allowing unused pastures total rest," explained Sid. "Ideally, I would like to graze 2 to 3 weeks and rest 4 to 6 months, but I have to rotate my summer country in the summer and my winter country in the winter, so my grazing periods are longer."

Conditions such as heavier snow cover in the higher elevation winter pastures, pine needles which cause abortion in the spring in some pastures, and a suitable special purpose pasture for calving, make it necessary to vary rotations.

"Any worthwhile grazing system must be completely flexible and should have an emergency or drought pasture," Sid added.

Sid uses a six-pasture rotation, planned so that no pasture will be used at the same time during the growing season 2 consecutive years. Cattle complete two rotations over the winter country and two to three over the summer country. Grazing periods vary in length with available forage. Flexibility is always assumed.

"I get most of my cows bred in May while on fresh pasture of western wheatgrass and bottlebrush squirreltail. This grazing system has cut my supplemental feed bill in half. However," Sid cautioned, "no system will pay unless you get a reasonable amount of rain and a fair return for your product.

"I've found that I can increase the effectiveness of my summer rainfall by leaving some old grass to cover the soil. This reduces evaporation, and is a very important consideration in the mountain areas of the West."

Invasion of pinyon and juniper onto the loamy soils continues to be a problem. Brush competes on these sites with desirable forage plants for light and moisture.

"Controlled burning is a range management tool we are not using," Sid said. "The only reason is the danger of the fire spreading across the fence into the National Forest."

Brush management is done by dozing. Brush is left along drainages for wildlife cover. Pinyon pine trees with good form are left for Christmas trees, nut production, and landscape plantings.

The Goodloes are pleased with the results of their plan. Range condition has steadily improved, along with calf-weights and total pounds of beef produced. Broom snakeweed has been reduced significantly and a desirable balance of warm and cool season grasses, forbs, and browse has been achieved. The need for supplemental feeding has been reduced, except during heavy storms in the winter.

"I haven't increased my stocking yet," said Sid, "but I have the forage to do it. Here again, the relationship of the price of cattle to the cost of supplement is the big factor."

A recent analysis of Sid's range showed a range condition class jump from good to excellent since 1964. Most of the benefit was due to an increase in western wheatgrass. From clippings, it was determined that total production on loamy soils in 1964 was about 700 pounds per acre with only 10 percent western wheatgrass. In 1976, these same sites produced 1,450 pounds per acre, 27 percent of this being western wheatgrass. Total precipitation was more favorable in 1976 than in 1964, but had only a partial effect on forage production.

The Goodloes' grazing system provides other benefits including less selectivity and more uniform use of the forage, easier herd control and observation, fewer fences and watering systems to maintain at one time, and shorter breeding time, resulting in a more even-age calf crop.

According to Sid Goodloe, "The only practical approach to a more economical ranch unit is a more intensive and multiple use of the land resources, coupled with a conservation program to perpetuate forage production and other resources."

Mr. Harkey is range conservationist, SCS, Carrizozo, N. Mex.
Mr. Marsh is area range conservationist, SCS, Roswell, N. Mex.

They Came Out Smelling Like a Rose

by Gene Warren

After getting the parish garbage under ground, club members tackled above-ground projects—a park, a scenic trail, an outdoor classroom, and more.

They used to call them the garbage women—but not anymore. Now the folks in and around Harrisonburg, La., call the Harrisonburg Women's Club "that group that put a lot of beauty back into Catahoula Parish and tons of garbage under ground."

What accounted for the shift in opinion? As Harrisonburg Mayor Charlie Myers put it, "We just finally woke up to the fact that those women were working for the good of us all."

The club has been cited for its community action programs and holds the distinction of being the only civic club in the State to have a conservation plan with a soil and water conservation district.

"I think our club has another first going for us," said Club President Juanita Terry. "In 1977, our club was selected as the Outstanding Conservationist in the Catahoula Soil and Water Conservation District (SWCD). We were honored by the Goodyear Tire and Rubber Company, sponsors of the program."

The club began crusading several years ago for a garbage program in the parish. The members set out containers throughout the community and arranged to have them emptied at a central landfill.

"With our garbage program accomplished, we set our sights on developing the wooded areas around our town so more adults and young people could enjoy the out-of-doors," said Terry. "We had an ace going for us because Molly McCarty, a past president of our club, is also a member of the Catahoula SWCD Board, so the district joined us in our outdoor projects."

The club got into full swing in 1974. About that time a local minister deeded 1 acre of land to the club with the idea of developing a park. That was like a shot of adrenalin for the club. The members quickly turned to the Soil Conservation Service, the Louisiana Office of Forestry, and other groups for technical know-how. The park area was smoothed and planted with grass. Picnic tables and other park facilities were built.

In 1976 and 1977, the club launched other projects. Again calling on agencies and other groups for aid, club members planned a 20-mile Dogwood Scenic Trail for drivers. Then with the cooperation of a local lumber company, 6 acres owned by the company was developed into an outdoor classroom. The adjoining Rock Creek Canyon was developed for hikers.

"Much of what we have done could not have been done without the full cooperation of many groups," said Molly McCarty. "I could give a long list of groups, but these come to mind: Catahoula Parish Police Jury, Levee Board, Parish School

Mollie McCarty and Bill Kassel, board members of the Catahoula Soil and Water Conservation District; Houison Horne, SCS district conservationist; and Daisy Johnson of the Harrisonburg Women's Club (left to right) work on planning future club projects.

Board, Rotary Club, National Guard, Catahoula SWCD, and Kisatchie Delta of Louisiana."

Is their work paying off? The park, the outdoor classroom, the scenic trail, and the Rock Creek Canyon drew almost 10,000 people in 1977.

"We are especially thrilled at the success of the outdoor classroom," said club member Lessie Crawford. "Each year the Catahoula SWCD plans a half-day at the center for all fifth and sixth grade students. Someone from SCS or the district takes them on a walk along the trail. We have identified a lot of interesting points along the trail and we feel that young students and adults can learn a lot about the out-of-doors."

The Harrisonburg Women's Club members have not slowed down. They see long caravans of people walking and driving their trails and picnicking in their park and are thankful for the parish cleanup program. But they have plans to lengthen the Dogwood Trail to more than 40 miles and expand the outdoor classroom to accommodate more children. The Parish Police Jury thinks so highly of the "garbage women" that they appointed them the Catahoula Parish Tourist Promotion Agency.

The club isn't big in numbers—just 22 strong—but spirit and hard work make up for it. As the club members put it, "They called us garbage women a few years ago, but now we smell like roses."

Mr. Warren is public information officer, SCS, Alexandria, La.

Meetings:

January

3–8	American Association for the Advancement of Science, Houston, Tex.
8–12	North American Game Breeders and Shooting Preserve Association, Kansas City, Mo.
9–11	National Council of Farmer Cooperatives, Las Vegas, Nev.
14–18	American Farm Bureau Federation, Miami Beach, Fla.
22–26	National Cattlemen's Association Convention and Trade Show, Houston, Tex.
28–31	National Wool Growers Association and National Lamb Feeders Association Joint Convention, Las Vegas, Nev.
30	Surface Mining and Reclamation Teamwork Symposium, Washington, D.C.

February

11–15	Society for Range Management, Casper, Wyo.
13–14	Southern Forest Institute, Inc., Houston, Tex.
13–16	Air Pollution Control Association, Gainesville, Fla.
13–17	Association of Interpretive Naturalists, Inc., Bloomington, Minn.
14–17	American Association of School Administrators, New Orleans, La.
14–17	Land Improvement Contractors of America, Nashville, Tenn.
19–24	American Camping Association, Minneapolis, Minn.
27–Mar. 1	American Society of Agricultural Engineers Domestic Water Quality Symposium, St. Louis, Mo.

March

3–7	Association for Supervision and Curriculum Development, Detroit, Mich.
3–8	American Society of Planning Officials, Miami, Fla.
14–16	Hardwood Manufacturers Association, Washington, D.C.
18–20	American Pulpwood Association, Atlanta, Ga.
18–23	The American Society of Photogrammetry, Washington, D.C.
23–25	National Wildlife Federation, Toronto, Ontario, Canada
24–28	North American Wildlife and Natural Resources Conference, Toronto, Ontario, Canada

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Soil Conservation

February 1979

U.S. Department of Agriculture

Working Together for Wildlife

From the Administrator

This month marks the 50th anniversary of the Migratory Bird Conservation Act. The act established a Migratory Bird Conservation Commission to review and approve proposals for the purchase or rental of areas under the act.

Waterfowl sanctuaries on public lands under this act are the nucleus of the national waterfowl conservation effort—but they can't do the job alone. These areas safeguard existing populations of migratory birds and reduce crop depredation. Nationwide, waterfowl habitat acquired under the Migratory Bird Conservation Act amounts to 10 million acres. State-controlled waterfowl habitat areas make up another 5.1 million acres.

However, a major part of the Nation's waterfowl habitat must continue to be provided on private land, usually in close association with agriculture.

Wetlands in private ownership provide valuable wintering, migrating, and breeding habitat for waterfowl. They also provide habitat for many other species of fish and wildlife.

In fiscal year 1977 alone, landowners in soil and water conservation districts managed more than 600,000 acres of wetlands for wildlife habitat.

USDA is striving to improve its ability to help these landowners blend food and fiber production needs with wildlife needs.

One way is by more carefully inventorying where wetlands are and identifying the options available for use and management. Last summer, SCS had a series of meetings with the U.S. Department of the Interior's Fish and Wildlife Service to improve the compatibility of our prime farmland studies and their inventory of wetlands of the Nation. This is part of an SCS effort to to aid the Fish and Wildlife Service with the use of soils information in a new national wetland inventory.

Another way is through the Water Bank Act. The water bank program offers a significant alternative to outright acquisition for the protection of migratory bird habitat. It also provides economic incentives for private landowners to maintain and manage wildlife.

In this golden anniversary of the Migratory Bird Conservation Act, let us continue to provide landowners and project sponsors with practical suggestions and alternatives for maintaining or improving fish and wildlife habitat.

To be successful, habitat management must be integrated with other conservation work.

Mel Davis

February 1979, Vol. 44, No. 7

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Soil Conservation

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- **Front—Severe flood damage from heavy rains in southern California last year left scenes such as this golf course near Anaheim. What is now a stream channel was the center of a fairway before floodwaters carried it away.**
- **Back—Another scene of devastation in southern California was this house in Ventura County. Before the flooding, the house sat 25 feet from the riverbank. Part of the house was torn away by floodwaters and carried downstream. See article beginning on page 7. (Photos, Donald C. Schuhart.)**

The Canyons Are Alive

by Frank M. Blackburn

Trees and soil undermined by erosion crash into the depths of Providence Canyons in Georgia. Diversions are helping slow the process.

Dramatic geologic formations can be viewed by visitors to Providence Canyons State Park. Water running down the highly erosive second layer, or Providence Formation, forms rills in the canyon walls. Sometimes the water will cut off a column of the Providence sands, isolating it from the wall (left).

Providence Canyons in southwestern Georgia have been called caves, gullies, and even a gulping monster.

The canyons lie in a rough, broken part of Stewart County where steep ridges rise to an elevation of 200 feet or more above the deeper stream bottoms. The gullied area covers about 150,000 acres. The gullies vary in width from a few feet to 400 feet or more and they vary in depth from 150 to 200 feet.

There are several theories on how the canyons formed. Some say the water dripping from the eaves of a barn started the erosion process, and some say it was a spring in the area that started it. Another theory is that settlers followed well-established Indian and animal trails and used them for roads, eventually wearing them down so much that it triggered the massive erosion that formed Providence Canyons.

Although these factors may have all contributed somewhat to the formation of the canyons, the main factor was the manner of use of the land by the settlers who built their homes in the red clay hills and cleared the land of its heavy growth of hickory, oak, and shortleaf pines to plant cotton. They set the stage for the creation of an unparalleled example of accelerated soil erosion.

On a cold morning after a heavy freeze or frost, Providence Canyons seem to be alive. As the frost and ice melt, the soil thrust from the canyon walls is released and drops to the canyon floor. It sounds much like sleet falling. The face of the canyons changes almost daily.

Three geological formations in the

canyons have been exposed by the erosion. The top layer is known as the Clayton Formation and is made up of sands and clays that eroded from the piedmont and northern parts of the State and were subsequently redeposited. The reddish clayton layer averages 15 feet thick but is as much as 25- to 30-feet thick in some places.

Underneath the top layer is the Providence Formation which is approximately 125 feet thick. This formation is made up of highly erosive chalky-white sands. Under the sand is the Ripley Formation. It is a gray clay and is highly resistant to erosion. Now that the canyons have eroded down to this formation, it is unlikely that they will get much deeper.

But erosion is still taking place at the head of the canyons and laterally along its sides. The lateral erosion is caused by water coming down the face of the tough upper Clayton Formation and eroding the underlying erosive Providence sands. This leaves the sandy-clay clayton material suspended and it eventually caves off and crashes to the canyon floor carrying trees and brush with it.

During the days of the Civilian Conservation Corps (CCC), many acres of land in and around the canyons were planted to trees. Eroded hillsides and gullies were planted to kudzu.

In 1971, with funds allocated by Stewart County, the State of Georgia, and the U.S. Department of the Interior's Bureau of Outdoor Recreation (now the Heritage Conservation and Recreation Service), 1,108 acres of the canyons area was purchased to be developed into a State park.

The following year the Georgia Department of Natural Resources and a planning firm asked the Lower Chattahoochee River Soil and Water Conservation District to provide an inventory and evaluation of the soil conditions in Providence Canyons.

Jerry Pilkenton, a soil scientist with the Soil Conservation Service, made a soil survey of Providence Canyons. Areas of 11 different kinds of soils were outlined on a map of the park and described. For each of the areas, eight land uses were evaluated: ponds and reservoirs, septic tank filter fields, roads and streets, fill material for roads, campgrounds, picnic areas, playgrounds, and paths and trails.

The soil map, soil descriptions, interpretations, and other information were provided to the Georgia Department of Natural Resources for use in planning the park.

Providence Canyons State Park has an information center where visitors can view pictures of the common vegetation of the area which includes rare plants such as the plum leaf azalea. The information center also has monoliths illustrating the kinds of soil around the canyons. The Park staff is available to answer visitors' questions on the botanical and geological aspects of the canyons.

The most dramatic canyons cover 200 acres of the park, and around their rim, 8,000 feet of fenced trails have been installed. Twenty well-placed lookout points provide visitors an excellent view of the vast canyons. Picnic tables with grills, one picnic shelter, and comfort stations are also available to park visitors. Currently, the park is open only during the day.

Diversions have been installed to safely carry water away from the canyon walls. They are generally seeded with an adapted grass such as common bermudagrass or 'Pensacola' bahiagrass. Short diversions near areas of heavy foot traffic are generally planted to periwinkle. Although the diversions are not able to stop erosion completely at the canyons, they are able to slow it down.

One primary concern of managers of the park area is maintenance of existing vegetation. Areas of stately pines planted by the CCC still stand in the park today.

Cement check dams, also from the days of the CCC, can be seen on a stroll through the park.

Since its opening, Providence Canyons State Park has gone from attracting a few hundred visitors to more than 120,000 visitors annually. The influx of visitors is having a favorable effect on the local economy.

Mr. Blackburn is district conservationist, SCS, Lumpkin, Ga.

The 3-Week Inferno

by Crystal A. Williams

When record storms hit California last year, flood control officials carefully watched the storms' effect on four major watersheds in Monterey County. Only 6 months earlier, the State's second largest fire had ravaged 178,000 acres of Monterey wilderness and other forest land.

What residents called the Marble Cone Fire—in 21 days of burning—had left the land charred and barren, and had raised the specter of a flood disaster that could cause up to $75 million damage.

As the 1978 storms receded, government officials and local property owners were pleasantly surprised. Flood damage to the four watersheds was minor.

Tree skeletons are the stark remains of 21 days of burning. The fire left the land vulnerable to further damage by flooding.

Credited with helping avoid serious disaster was an interagency restoration effort that began as soon as the ground cooled in August 1977. The following month, watershed residents and representatives from 29 government agencies met to review a comprehensive damage report and determine what should be done.

Proposed was a variety of emergency work including seeding, debris removal, clearing and snagging along channels, and installation of an early flood warning system. The watershed restoration work would be carried out under the Flood Control Act of 1950's Section 216, administered by USDA's Soil Conservation Service.

A few days later, USDA's Forest Service and other agencies began planned measures in the four burned watersheds—Big Sur, Little Sur, Carmel, and Arroyo Seco. Almost $2 million was spent to clear 145 miles of channel, seed 156,000 acres by air, and hand-seed 160 miles of fire suppression lines to annual ryegrass.

By the end of November, there were only a few jobs left to be done. But winter rains came, and nothing could be done except wait out the bad weather.

When the heaviest storms subsided in March 1978, only minor damage was reported on the treated watersheds. "The clearing work done right after the fire prevented any extensive storm damage," said Gene Ares, SCS district conservationist at Salinas. "Potential floodwaters stayed within the channels."

Aerial seeding in the watersheds was nearly 65 percent effective, according to Robert Hammond, Forest Service district resource manager. "Seed didn't take in some areas because of strong winds, but other areas looked like pastures with a solid stand of chest-high grass."

A recent California Department of Fish and Game (CDFG) survey shows that it will be a decade before fisheries return to their prefire condition, and that deer, birds, and small forest wildlife are beginning to move back into areas with water supplies.

Throughout the restoration process, CDFG officials worked closely with other agencies to minimize adverse impact of stream channel work.

Local reaction to the emergency work has been positive, according to Gary Koeppel, member of the Big Sur Coordinating Committee, a citizen group that helped with the project.

Dusan Petrovic, chairperson of the Monterey County Board of Supervisors, agreed. "The restoration work was undertaken with a minimum of red tape or delay," he said. "And best of all, it prevented the catastrophic flood damage we feared might happen after the fire."

Ms. Williams is a public information specialist, SCS, Davis, Calif., and presently a graduate student in radio and television broadcasting.

Rainfall turned into deluge and Californians had to move quickly to restore damaged watersheds.

by Judith E. Ladd

After the rain

A natural gas pipeline, which had been buried, hangs above a channel torn out by raging floodwaters.

Previously buried irrigation pipes were left hanging after floodwaters carved a 100-foot chasm through an avocado orchard in Ventura County.

When a grill at the top of a protected water chute became blocked by debris, stormwater cut a new path, exposing a gas line and eroding the bank.

When the rain began to fall in Southern California in early February last year, area residents breathed sighs of relief. At last they could see an end to the 2-year drought.

Their relief turned to alarm, however, as the rain continued day after day. For 6 weeks, southern California was battered by storms. And when the rain ended in mid-March, the area had received more than three times its normal rainfall.

The damage was widespread and devastating. Normally slow-moving streams became raging rivers, carrying along everything in their paths—trees, soil, and boulders. The storms left waterways clogged with silt and debris, caused landslides, eroded and undercut streambanks, and severely damaged flood control structures. The storms affected homeowners, farmers, ranchers, and city dwellers alike.

Duffy Lewis, a homeowner who lives beside Pickens Creek in La Crescenta, 20 miles northeast of Los Angeles, said he lost 8,400 square feet of his backyard.

"One night when the rains started getting heavy, I went outside with a five-cell flashlight to see how high the water had risen in the creek," said Lewis. "I was just about to step over a little foot-high chain fence in my backyard when I shined the flashlight down and saw the water rushing by right in front of me. If I had stepped over that chain, I would have been gone.

"I've never seen or heard anything like it," he continued. "Two people standing next to each other in my backyard couldn't have heard one another over the roar of the water.

"Boulders came crashing down with the water, banging against the sides of the canyon. The furniture in my house and my neighbor's across the street jumped from the force just as if an earthquake had hit."

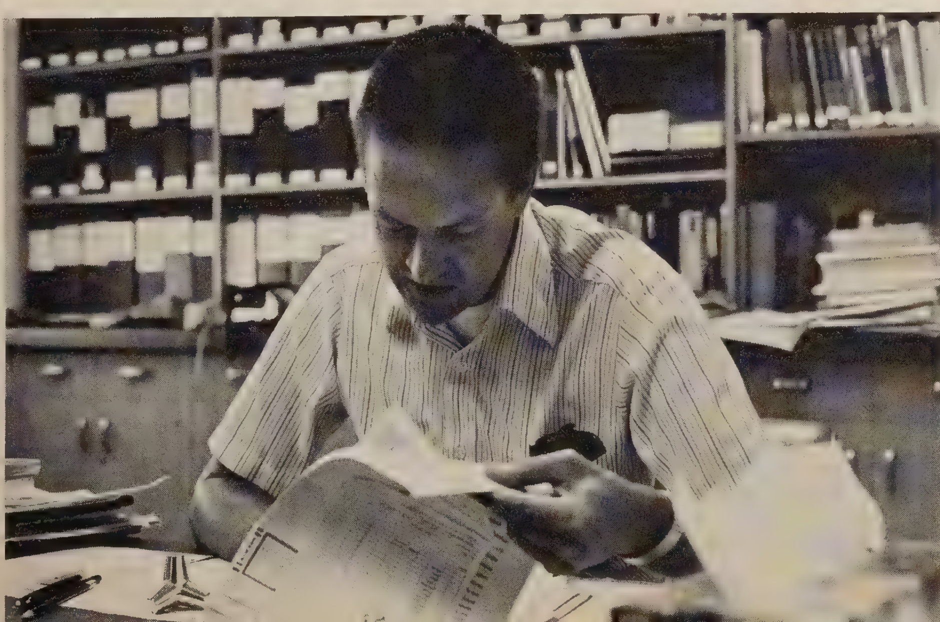
South of Los Angeles near Escondido, heavy stormwater in Moosa Creek cut a new channel for about 200 feet and washed out half the road it used to flow under. About 25 ranches and homes in the area were affected by flooding.

During the storms the channel of the Salinas River in Monterey County widened 50 feet or more, eating away at $5,000-an-acre land along its banks where high-value crops are grown.

A golf course near Anaheim in Orange County now has a river running through what used to be a fairway.

In Riverside, a soaked hillside slid down onto houses below, snapping them in half and filling them with mud and debris.

Similar scenes took place in county after county—until nearly 15 million people were affected in the 70,000-square-mile area. President Carter declared southern California a major disaster area, making emer-



James Stubchaer, head of the flood control district in Santa Barbara County, reflects on the magnitude of the job to be done. Last year's flood disaster in southern California was the second worst in the State—topped only by the destructive storms of 1969 when 33 counties were declared disaster areas.

gency funds and assistance available to 13 counties.

The Federal Disaster Assistance Administration (FDAA) and the State Office of Emergency Services coordinated initial emergency programs to relocate people who had lost homes and to save property from rising waters. From the beginning of the heavy storms, local flood control districts worked around the clock fighting floods that seemed unending.

An emergency center was set up in the Federal courthouse in Los Angeles. The center housed temporary offices for FDAA, the Soil Conservation Service, the U.S. Department of Housing and Urban Development, and other Federal and State agencies.

Once people were quickly mobilized and organized, Federal emergency work began in full force. Flood control districts, the U.S. Army Corps of Engineers, SCS, and other agencies, surveyed damaged areas. As the surveys were made, a damage survey report (DSR) was prepared for each site investigated. Each DSR described the damage and recommendations for repairs along with an estimate for the cost of repairs.

DSR's then were reviewed to determine various agency responsibilities and to assure that sites posing an immediate danger to life or property were repaired quickly.

Based on the damage surveys, about $52 million would be needed for emergency watershed work under Section 216 of Public Law 81–516, the Flood Control Act of 1950. The task ahead was enormous for SCS, which administers the emergency watershed program, providing technical and financial assistance. Nearly 350 projects were involved and included:

- Restoring 420 miles of stream and river channels.
- Revegetating 18,000 acres of denuded land.
- Cleaning out 57 debris basins.
- Repairing 1,200 miles of National Forest roads.
- Repairing 21 miles of levees and dikes.

"The objective of emergency watershed protection is to safeguard lives and property from future flooding and the products of erosion," noted Pat Burke, SCS district conservationist for San Diego County. "We are concerned with restoring damaged areas to the condition they were in just before the storm."

SCS responsibilities in the 13-county area include providing cover for land stripped of topsoil, opening channels clogged by debris and sediment, shaping and stabilizing streambanks that were cut away during the floods, cleaning debris basins, and repairing or replacing channel stabilization structures.

It was obvious that the job was a big one, the largest emergency undertaking in agency history. SCS

In Riverside County, homes built at the base of a highly erosive cliff were "remodeled" during the storms when the cliff slipped downhill and squeezed kitchens into living rooms.

people from throughout California were brought into the area to help in the disaster counties and to staff the temporary Los Angeles office, which soon was dubbed "LA Central."

"It was quickly apparent that we didn't have enough SCS people in the State to handle the work, and we began calling on other SCS State offices for help," said Francis Lum, SCS State conservationist for California. "We especially needed additional people who were experts in engineering, contracting, and construction inspection."

So far more than a dozen States have sent volunteers on details of 6 weeks or longer. Included are SCS employees from Hawaii, Montana, Nevada, New Mexico, New York, Oklahoma, South Dakota, Utah, Washington, Wisconsin, and Wyoming, as well as SCS's West Technical Service Center.

"They've also come from Idaho and Pennsylvania . . . people whose experience dealing with the Teton Dam and Johnstown Flood restoration work has proved valuable in helping get the job done in California," Lum said.

The out-of-State volunteers join either the LA Central staff or one of the county teams, according to LA Central project manager Jack George. "County teams are made up of engineers, conservationists, and technicians who help plan the repair projects, then oversee their construction. Because of their close working relationships with people in the communities involved, SCS district conservationists were selected as the county team leaders."

The LA Central operation also is conducted on a team approach. "We have people working here in a wide variety of jobs, such as agronomists, biologists, hydrologists, resource conservationists, engineers, public information specialists, administrative specialists, and landscape specialists," explained Herman Cohen, assistant project manager at LA Central. "Coordination between sponsors, county teams, and LA Central is eased by management and liaison teams."

After early decisions were made regarding eligibility of each of the 350 projects, management teams and team leaders sat down with flood control district leaders to determine design and construction schedules for local projects. Local sponsoring officials also set priorities for completion of each project in the county.

County governments agreed to assign more than 175 people to help carry out the emergency program. Local agencies provided design engineers, drafting specialists, and construction inspectors. One Los Angeles County employee, Civil Engineer Michael Oliver, joined the LA Central staff as a contract specialist from September until the office was closed in December.

Receding floodwaters near Escondido left their mark: silt deposited on irrigated pastureland.

Soon after the storms were over, restoration work began. Crews cleaned debris from a canyon northeast of Los Angeles to protect the watershed from future flooding.

Before design, an environmental assessment was prepared for each project. Projects then were designed to minimize potential adverse impact on the environment.

Where wetlands or endangered animal species were involved, USDI's Fish and Wildlife Service was consulted. The Corps of Engineers reviewed projects in all counties to determine whether permits were required for work in channels.

Rights-of-way and access permits to do the needed onsite work had to be obtained, as well as permits from the California Department of Fish and Game, and if the project was located in the coastal zone, permits from the California Coastal Zone Commission.

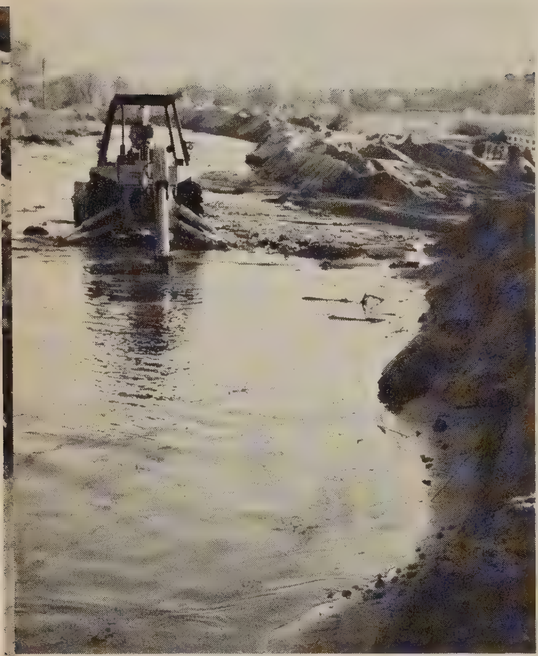
"Plans for any work in coastal areas has to go before the Coastal Zone Commission, including plans for disposal of sediment cleared from channels," explained James Stubchaer, head of the flood control district in Santa Barbara County. "Time for all of these requirements needs to be included when scheduling even emergency projects."

Since many of the projects involved the need for revegetation, county teams worked with local resource conservation districts to develop land treatment plans for emergency watershed work.

As each project was developed, plans, landrights, permits, and other supporting documentation were sent by county teams to LA Central. After plans were reviewed and accepted, the LA Central staff developed a bid proposal, sent out notifications to contractors, scheduled site showings, accepted bids, and awarded contracts.

"The awarding of the contract doesn't mean the end of work for us," noted District Conservationist Don Hansen, team leader for Santa Barbara County. "Either an SCS or a flood control district inspector must be onsite during construction

SCS District Conservationist Don Hansen inspects a 3-foot-high concrete wall built to stabilize the toe of the streambank. Water rushing around a bend in the stream undercut the base of the original structure.



Miles of sediment-choked channel in San Diego County required cleaning before rains brought the threat of additional flooding.

to see that the project is done according to plan. The project also has to have final inspection and be approved before the contractor is paid the balance of the money."

While the work had its complexities, the magnitude of the program was considered its greatest challenge by Californians involved in the emergency effort. "It's really something to be thrown into a program of this size," Stubchaer said. "Facing this much critical work—and the need to get it done quickly—requires an exceptional amount of effort and cooperation."

By the end of December, nearly 500 contractors had been contacted to do the restoration work. More than 100—including some from as far away as Pennsylvania and Oklahoma—had been awarded contracts to carry out projects that ranged from $10,000 to $1.7 million.

There was an urgency to the effort—a race against time and weather. The most critical work had to be done before winter rains arrived and brought with them the prospect of more extensive damage to California watersheds.

In the 3 months following release of funds provided by Congress for the $52 million program, over two-thirds of the projects had been designed and more than half the projects either were completed or under construction.

Californians credit a strong cooperative effort by local, State, and Federal agencies for making the massive, complex restoration task successful. Watersheds are being restored, hillsides covered, channels cleared, and people and their property protected.

Ms. Ladd is editor, *Soil Conservation*, SCS, Washington, D.C.

Banks along the Salinas River in Monterey County are stabilized by tying together wire baskets filled with rock. Afterwards, the rock and wire are covered with soil and planted to erosion-control shrubs.

Save Our Streams— Adopt One

"Defenders of soil, woods, waters, air, and wildlife" is the motto of the Izaak Walton League of America.

by Shirley Foster Fields

Our Nation's streams are important water supply sources for agricultural, municipal, and industrial uses. They also offer recreational opportunities such as fishing, swimming, and boating. These are two of the many reasons the Izaak Walton League has developed a program to "save our streams."

Some people love streams as they love children. And when they do, they adopt one.

"Save Our Streams (SOS)—Adopt One" is a national citizen action program originated by the Izaak Walton League of America. In 29 States, troubled waters are becoming clearer streams thanks to the work of citizens who place high value on a restored environment. And the number of "adopting parents" is increasing.

People who adopt a stream are encouraged to know every characteristic of that stream through onsite, firsthand experience. The "Ikes"—members of the Izaak Walton League—call this their "hands-on" policy. In summer and winter, in sunny and rainy weather, they walk the banks and wade in the waters of their adopted streams. By sight, sound, smell, and touch they observe and evaluate: water quality, soils, the presence or absence of wildlife, streambank vegetation, urban encroachment, and numerous other environmental factors.

As they work, they ask themselves: Is this stream healthy or sick? If the answer is "sick," their quest may eventually bring about the stream's healing.

It is not necessary for an SOS stream adopter to be a professional scientist or technician. Factors that influence the life and death of a stream are diversified, but many are easily identified and understood by ordinary people.

No special knowledge is required to perceive the difference between streams clogged with sediment and fish-killing algae, and streams that run fast and clean—uncontaminated by pollutants that accompany soil erosion.

Untrained eyes can detect sewage outfalls and the effects of eroding streambanks, toxic runoff from agricultural chemicals and improperly managed animal wastes, refuse dumps, and manmade and natural stream barriers.

Stream parents carefully note these and other conditions—stream size, streambank habitat, and watershed environs, for example—on an SOS stream survey form. The stream survey is not a document that satisfies the exacting requirements of hydrologists, limnologists, or agricultural engineers. But if a stream is ailing, it defines the apparent cause of the ailment in clear but general terms.

SOS county "coordinators" receive the surveys and distribute them among local and State environmental and water quality authorities. Professional environmentalists may then be assigned to inspect polluted streams, and recommend conservation measures that will bring about a cure.

At this point, it is the ordinary citizen who once more carries the ball. The Ikes call for volunteer conservation workers, and citizens respond.

At 288 Save Our Stream projects, thousands of unpaid volunteers are working with technical experts to restore the environmental integrity of America's streams, lakes, and rivers. Individuals and groups that answer the SOS call represent civic, social, business, church, and government organizations.

The stream-healing tasks performed by the SOS volunteers are diverse. If litter is a problem, the SOS team organizes cleanup days with the help of local Scout troops, adult conservation clubs, church groups, or high school ecology clubs. If wildlife habitat will be destroyed by proposed urban development, the point is emphasized at public hearings on rezoning or approval of construction permits. If sediment exceeds acceptable limits, upstream farmers or ranchers are apprised of no-cost technical assistance available from USDA's Soil Conservation Service and their local soil conservation district in installing conservation practices that reduce soil erosion.

Roy Overton of Des Moines, Iowa, is a practicing physician whose healing art reaches well beyond the city's hospitals, his patients' homes, and the doors of his office. He is a general practitioner for people—and no less a general practitioner for streams.

Iowa State chairperson of Save Our Streams and a board member of the Des Moines Chapter of the Izaak Walton League, Overton spearheaded an effort to restore litter-strewn Walnut Creek.

On the outskirts of Des Moines, in suburban Urbandale, the creek meanders from northwest to southeast through the Urbandale shopping center. It then flows directly into the Raccoon River, the source of drinking water for Des Moines' citizens.

The portion of the creek that flows through the shopping center is only two city blocks long. It is hemmed in

on both sides by enormous concrete and asphalt parking lots. A pizza restaurant is located near the creek's east bank, and to the west there is a large department store. The two parking lots, joined by bridges that span the stream, accommodate 1,800 cars a day and at least double that number of shoppers. This, then, was the setting for SOS action and the rescue of the stream.

Why the rescue?

Three years ago, this stretch of flowing water was the victim of almost every insult that can befall a city stream. All manner of refuse—newspapers, beer cans, paper plates and napkins, plastic eating utensils —blew off the parking lot and littered the banks of the stream. Ragged clods of soil were eroding from its banks, and its waters were a junkyard of mud-covered shopping carts and the twisted, rusting bodies of abandoned cars.

"Those shoppers ran back and forth from the pizza parlor to the department store to the parking lot," Overton said. "They ran and they looked, but they never did see. They didn't see the redwing blackbird in the bushes beside the creek. They had forgotten how important it is to develop an awareness of beauty within themselves."

And so Overton decided to help the citizens of Des Moines sharpen this inner awareness. He signed the Ike's official SOS adoption papers, and assumed full responsibility for the healing and continued well-being of Walnut Creek.

Overton first launched an attack on litter. He called League members for help, then contacted newspaper

Roy Overton (in dark shirt) called on fellow "Ikes" to help clean up Walnut Creek. The Ikes had to remove litter and debris such as abandoned cars and shopping carts. They also asked SCS for help in controlling streambank erosion.

editors and radio and television reporters to announce the creek's coming transformation.

Forty people—all Ikes—answered Overton's call to action. From the parking lots and the bridges, hundreds of people watched the stream's rescue. It was a celebration, an all-media event. The owner of the pizza parlor donated pizzas and beer. Television cameras whirred. Radio announcers wandered about interviewing onlookers. Newspaper reporters took notes.

"First we had to get rid of the abandoned cars," Overton recalled. "We were lucky. We found a man with a crane at a nearby construction job. At no charge, he dragged the cars out of the creek, and we hauled them to a landfill 15 miles out of town.

"Then we removed the shopping carts. There were 20, some so deeply buried in mud that we had to drag them out with ropes attached to a truck. Ten were salvageable, so we repaired them and sold them for $50 apiece. We used part of that money to buy a picnic table and trash cans that we placed near the edge of the stream."

Streambank erosion was a problem that required expert help. The Ikes called the Polk County Soil Conservation District. The district asked SCS District Conservationist Bill Mills to examine the site. Mills recommended abundant plantings of crownvetch and honeysuckle down to the water's edge.

Mills supervised while the Ikes did the digging and the planting. Today, the two plants, thanks to their thick root systems, are keeping soil on the streambank and out of the creek. This, in turn, reduces sediment in drinking water downstream.

"Why do I think the adoption of this little scrip-scrap of a city stream is important?" Overton asked. "Certainly water pollution is a massive problem nationwide. So, what real difference does Walnut Creek make?"

The physician answered his own question: "People at the shopping center stopped rushing for awhile. They paused and they looked. They saw what we did. And it caused some to realize that out of indifference or ignorance, *people* pollute this Nation's streams and people can make them clean."

Although Walnut Creek has been healed, Overton's work is not done. With characteristic fervor, he and his fellow Ikes have adopted a larger, rural stream—Beaver Creek, northwest of Des Moines. This time the enemy is far more pernicious than litter. It is nonpoint source water pollution.

Beaver Creek, Overton explained, is typical of Iowa's rural streams, and that is why he chose it for study. It drains some 800 acres of prime agricultural land, "just about the finest quality farmland for crops and livestock found anywhere in Iowa."

But whether it is high quality or poor, agricultural land can hold the residues of insecticides, herbicides, nitrogenous fertilizers, and animal wastes, and slowly yield these to rivers and streams through soil erosion. The amount of pollutants in the stream at the point of entry may be harmless and so small as to defy detection. But when washed downstream with sediment, these nonpoint source pollutants can become concentrated enough to kill fish and create hazards to human health.

For an hour or two every Sunday, no matter what the weather or the season, Overton either walks the banks or floats on a rubber raft taking water samples from Beaver Creek. He regularly sends his water samples to a laboratory for pollution analysis, and his discoveries are neither cheering nor surprising.

"The water shows high levels of coliform bacteria. These bacteria live mainly in the digestive tracts of warm-blooded animals and indicate contamination by human and animal wastes," Overton explained. "In themselves, they are not harmful. They are indicators. Their presence shows that conditions in the stream are favorable for the existence and growth of organisms that cause such diseases as dysentery, cholera, hepatitis, and typhoid fever."

There is no doubt that the muddy waters of Beaver Creek carry several or all of these pathogenic organisms. Why, then, have there been no recent outbreaks of the diseases? Perhaps, Overton speculated, it is largely a matter of luck. No one has been foolish enough to swim in the creek's polluted waters and no one has accidentally fallen in.

"But some day some youngster may take a dare from a friend and deliberately dive in," Overton said.

The Ikes are not waiting for that day to come. In their own way, they are stirring the waters of public opinion to hasten every possible effort—statewide and nationwide—to make America's streams clean.

Every year, the Des Moines Ikes set aside $4,000 for a scholarship fund at Iowa's Drake University. The scholarship is awarded to a student of limnology, the study of freshwater streams, ponds, and lakes.

"Limnologists are rare and valuable people," Overton explained. "They aren't easy to find, and we need many of them. Right now we are paying the tuition of an especially gifted student who has made a 1-year study of Beaver Creek.

"Neither his studies nor mine have resulted in great or startling scientific discoveries. And we didn't expect that. What we do hope is that our work will dramatize the need for better management of livestock wastes on Iowa farms and on all American farms, and better soil conservation practices everywhere to reduce erosion and runoff."

Overton and the Ikes nationwide are well aware of Public Law 92–500—the Federal Water Pollution Control Act Amendments of 1972—that calls for the restoration and maintenance of the "chemical, physical, and biological integrity of the Nation's waters by 1983."

They are aware, also, of Section 208 of the act and of Iowa Senator John C. Culver's amendment authorizing cost-share funds to rural landowners for soil and water conservation measures that will reduce nonpoint water pollution. They are observing with keen interest the cooperative work of the Soil Conservation Service, soil conservation districts, the Environmental Protection Agency, and State and areawide 208 agencies in getting the Rural Clean Water Program underway.

Overton (left) adopted Beaver Creek, northwest of Des Moines. He periodically takes water samples from the creek and has them analyzed for pollution.

At their July 1978 annual convention in French Lick, Ind., the Ikes adopted a resolution on the Rural Clean Water Program that states, in part: "Sediment, fertilizers, pesticides, and animal wastes in agricultural runoff are major polluters of the Nation's waters. They form a substantial part of nonpoint pollution, which, as a whole, is responsible for about 50 percent of our water pollution. Nonpoint sources of pollution are so serious that failure to control them will prevent achievement of the Federal Water Pollution Control Act's goal of 'fishable, swimmable waters by 1983' even if all point source discharges are cleaned up."

Overton was at the Ike's conventon. He stated: "Only now as a Nation are we beginning to see very clearly how much easier it is to foul our waters than to clean them. Can we afford to ignore the evidence any longer?"

The Ikes have at least one solution to the problem: "Save Our Streams—Adopt One."

Ms. Fields is a public information officer, Information Division, SCS, Washington, D.C.

And the Winners Are . . .

Terry Joe Shaw
NACD Teacher of the Year
First Place

by Thomas W. Levermann

"Learning about the environment and the proper stewardship of our natural resources is not only fascinating, but also an essential part of an adequate education.

"In a nonthreatening, supportive atmosphere, students can reach beyond themselves and become physically and mentally involved in the whole environment."

This is the philosophy of a winner: Terry Joe Shaw, the 1978 recipient of the National Association of Conservation Districts (NACD)—Allis-Chalmers Conservation Education Teacher-of-the-Year Award.

The primary goal of Shaw's program at the Stillwater Middle School in Oklahoma is instilling in students a sense of responsibility for stewardship of our natural resources. He tries to help each of his sixth grade students develop the feeling that "What I do makes a difference."

Shaw uses real-life situations to help students become more aware of how values can conflict with each other. For instance, students may say they would like to own off-road vehicles but that they are also concerned about declining wildlife habitat. To help them make a decision, he shows them how to consider and critically analyze both wildlife habitat needs and the rights and responsibilities of owning off-road vehicles. Shaw feels that this and similar exercises will help students make wise decisions in the future about managing the environment.

Shaw bases his environmental conservation education program on six major criteria: student involvement, ethical behavior in relation to the environment, educational activities that apply to real-life situations, motivation, open-endedness, and problem-solving skills. Shaw tries to meet as many of the criteria as possible in the activities he designs.

After completing the land-use unit, one sixth grader asked his contractor uncle, who was having trouble with cracked driveways and foundations, "Did you check the shrink-swell potential of your soils?" Thus, as a spinoff of education, an important conservation consideration was passed on to another person.

Throughout the school year, many of Shaw's activities are held in the school's outdoor classroom, which the students developed themselves. Each activity is geared to sharpening skills such as measuring, observing, classifying, and communicating. To give students a broad perception of the environment, Shaw incorporates science, mathematics, language arts, social studies, art, and physical education into his environmental conservation education program.

Near right, Terry Joe Shaw shows a student how to use a wind meter. His students use various scientific testing techniques to study environmental relationships. Far right, Shaw's sixth grade class had several entries in an annual environmental education poster contest. One of his students won first place.

Shaw also organized and developed a program called "Adventures Beyond the Classroom," a 2-day outing for sixth graders. Students investigate various environmental relationships; learn about soil types and their characteristics; take part in map reading, arts and crafts, and sensory awareness activities; and write poetry and stories.

A favorite of the students is the land use planning activity developed by the Soil Conservation Service, and supplemented by resource materials from other agencies and organizations. Students devise the best land use plan for 1 square mile just outside town. They must consider how soil types; flood plains; availability of roads, water, electricity, and sewer; and other factors influence land use.

The Payne County Conservation District, Oklahoma State University, and many people from the community have provided valuable assistance to Shaw and his "Adventures Beyond the Classroom" program.

Terry Joe Shaw wants his students to have the skills and knowledge to make intelligent resource decisions and to develop an appreciation for the order and beauty of nature. "When this is accomplished," said Shaw, "each student will have developed a conservation ethic, which will translate into a personal commitment to be wise stewards of our natural resources."

Mr. Levermann is an educational relations specialist, Information Division, SCS, Washington, D.C.

John Dolson NACD Teacher of the Year Second Place

by Kay Mergen

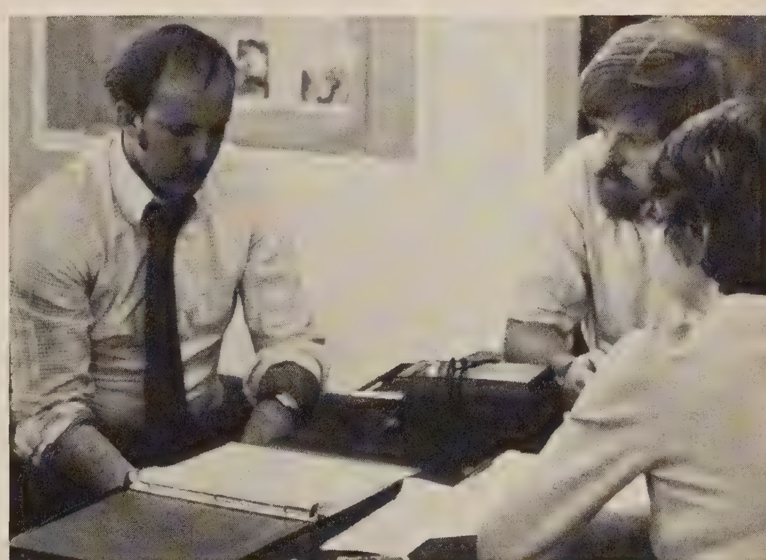
John Dolson, science teacher at Bill Reed Junior High School in Loveland, Colo., credits "good team work" for the success of the environmental education program that won him second place in the NACD—Allis-Chalmers Conservation Education Teacher-of-the-Year awards program.

Jim Weyand, principal at Reed School, while recognizing the contributions of students, teachers, and many other people in the community, credits Dolson with the energy and leadership that moved the program out of the planning stage and into action.

With the cooperation of Jeanne Bolton, chairperson of the science department, and five other science teachers, Dolson organized the school's environmental education program as a 3-year unit for seventh, eighth, and ninth grade students.

Seventh graders at Reed study soil, water, plant needs, classification of plants and animals, population, and energy. Part of their introduction to the environment is the annual "Outdoor Experience," a series of backpacking trips to nearby wilderness and primitive areas in groups of 40 students and 4 teachers. More than 100 teachers and 2,500 students have participated in these outings which combine environmental studies with planning the details of the trip—food, shelter, and safety.

When students move into the eighth grade, they continue studying the environment, investigating such things as the measurement of matter, chemical reactions, energy sources, and pollution. Environmental projects on the school site and outdoor resource studies are also part of the eighth grade program.



John Dolson (left) and two of his science department colleagues work together to plan the annual Outdoor Environmental Experience for students and teachers.

In the ninth grade, students begin to translate their learning experiences into community action. They often meet with city and county officials to discuss local environmental issues.

Throughout the 3-year program, students suggest projects, recommend changes, and help plan studies which especially interest them.

Dolson explained that the educational objectives for the junior high unit are "producing a well-rounded citizen who fully understands the complexity of environmental problems. Students analyze projects, make decisions, and accept responsibility for their completion and evaluation."

Since the junior high program has been underway, enrollment in optional ninth grade science courses has increased markedly as students decide to follow up on various environmental interests.

Dolson has received a Federal grant for developing energy studies. In one energy project, ninth graders investigated heat loss in winter from several houses in relation to the cost of insulation, weatherstripping, and sealing windows. The students drew up specifications for the work and installed energy saving improvements in several homes belonging to elderly residents and families on fixed incomes.

The students' second energy project was designing and building a solar-powered greenhouse on the school site. Reed Junior High classes now study soils and food plants in the greenhouse. Local engineers and construction workers review and evaluate all designs and specifications for building projects done by the students and inspect the projects after they are completed.

Soil investigations are basic to the ecological studies program for seventh graders at Reed Junior High School where John Dolson has developed a comprehensive three-unit program in environmental studies for seventh, eighth, and ninth grades.

A group of ninth graders is working this year to repair damage done to the Larimer County Fairground by the 1976 Big Thompson flood. With help from Soil Conservation Service personnel, soil investigations were made and appropriate grasses selected for revegetating the area.

In preparing for the project, students also studied watershed management, weather patterns, economic and human costs of the disaster, and the consequences of leaving the land unprotected. The Big Thompson Soil Conservation District helped provide technical assistance in preparing the soil and contributed $50 for the purchase of grass seed.

Increasingly, environmental education objectives and learning projects developed at Reed are being adapted to other junior high programs in the school district.

Not long ago, the Loveland League of Women Voters asked Dolson and his students to set up a recycling center for waste paper collected in the community. The class is looking into a market for using the paper to make cellulose insulation to help people save energy.

It doesn't seem likely that John Dolson and his junior high school students, colleagues, and community friends will run out of action projects.

Ms. Mergen is head of educational relations, Information Division, SCS, Washington, D.C.

New Publications

The Reclamation of Disturbed Arid Lands

by the American Association for the Advancement of Science (A.A.A.S.)

In February 1977, in Denver, Colo., the Committee on Desert and Arid Zones Research of the Southwestern and Rocky Mountain Division of A.A.A.S. sponsored a symposium on recent and current research on the reclamation of mined land in the arid United States. "The Reclamation of Disturbed Arid Lands" is a collection of presentations made at the symposium.

The 11 presentations are organized under three main topics: an overview of research, reclamation studies at the Argonne National Laboratory in Illinois, and reclamation research in arid regions. The term "arid" is used to mean areas with mean moisture deficiency.

The presentations in the first section deal mainly with research on the feasibility of and methods for restoring the ecological balance in arid lands disturbed by mining. They cover research in revegetating mine spoils and the need for more long-range studies of the success of revegetation efforts.

The second section tells about studies made at the Argonne National Laboratory on the effect mining has on water quality in Western States, the economics of reclaiming mined land and land use planning, and the socioeconomic impacts of coal development in the West.

The presentations in the third section tell about potentials and predictions concerning reclamation of semiarid mined lands, plants and treatment for revegetation of disturbed sites in the intermountain area, how endocellular fungi improve shrub growth and survival on mine spoils, the effects of New Mexico humate deposits on restoration of mine spoils, and some applications of hydrologic simulation models for design of surface mine topography.

Maps, tables, charts, diagrams, graphs, and photographs illustrate the publication. A list of references follows most of the presentations.

Single copies are available from the University of New Mexico Press, Albuquerque, N. Mex. 87131. Single copies are $4.95.

Meetings:

February

11–15	Society for Range Management, Casper, Wyo.
13–14	Southern Forest Institute, Inc., Houston, Tex.
13–16	Air Pollution Control Association, Gainesville, Fla.
13–17	Association of Interpretive Naturalists, Inc., Bloomington, Minn.
14–17	American Association of School Administrators, New Orleans, La.
14–17	Land Improvement Contractors of America, Nashville, Tenn.
19–24	American Camping Association, Minneapolis, Minn.
27–Mar. 1	American Society of Agricultural Engineers Domestic Water Quality Symposium, St. Louis, Mo.

March

3–7	Association for Supervisors and Curriculum Development, Detroit, Mich.
3–8	American Society of Planning Officials, Miami, Fla.
14–16	Hardwood Manufacturers Association, Washington, D.C.
18–20	American Pulpwood Association, Atlanta, Ga.
18–23	The American Society of Photogrammetry, Washington, D.C.
23–25	National Wildlife Federation, Toronto, Ontario, Canada
24–28	North American Wildlife and Natural Resources Conference, Toronto, Ontario, Canada

April

1–6	American Concrete Pipe Association, San Antonio, Tex.
4–6	Engineering Geology and Soils Engineering Symposium, Moscow, Idaho
22–25	Association of American Geographers, Philadelphia, Pa.

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March 1979

Soil Conservation

U.S. Department of Agriculture

Technology for Conservation: Why Not the Best?

From the Administrator

To bring the "right and best" technology to bear on the conservation of soil, water, and related resources is a continuing challenge to the Soil Conservation Service, conservation districts, and land users.

The challenge will grow greater as the Nation embarks on new initiatives, such as reclamation of surface-mined lands and control of agriculture-related nonpoint pollution.

SCS's traditional position on the matter remains the same: There simply is no alternative to the best available technology to correct conservation problems.

In practice, for a number of reasons, we and our conservation partners do not always achieve the objective of excellence we have set for ourselves.

To keep and improve on our good reputation for high-quality work, SCS and districts together need to evaluate our approaches, practices, and procedures regularly to insure high performance standards.

District conservationists should consult with districts in the development and revision of SCS field technical guides so that standards and specifications are adapted to local conditions. District officials have a great deal to contribute to delineating the diversity of local resources and problems.

Valuable and basic as they are, technical guides are not rulebooks cast in stone. It is up to local conservationists to take advantage of the opportunities that the guides provide to develop alternative approaches to solving unusual conservation problems.

There should be wide recognition of the need for employees at the district level to undergo periodic training. District conservationists especially need to keep current on the constant changes in conservation technology through training sponsored by SCS and others.

No single factor has more significance in high-quality conservation work than an innovative spirit pervading the entire conservation field. The search for better answers should be widespread and unremitting.

There should be feedback and "feedforward": new techniques and ideas demonstrated in the field should be communicated upward, and new technological findings should be channeled from the national, technical service center, State, and area levels downward to the district level.

It is in the dynamic pooling of SCS and districts' distinctive knowledge and experience that the "right and best" technology will be put to use in conserving the Nation's natural resource base.

Mel Davis

March 1979, Vol. 44, No. 8

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Soil Conservation

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Cover:
The annual report of SCS activities for fiscal year 1978 shows that SCS helped landowners install nearly 500,000 acres of stripcropping during the year. See pages 17 through 20. (Photo, Erwin Cole.)

Skiing in Winter Gullies in Summer

by Glenn Garvey

Skiers swooshing down snow-covered hills in winter don't cause erosion, but water running down the same steep slopes the rest of the year does. When tree cover is removed from rugged hills to make ski slopes and when parking lots are carved out of sandy side hills, problems with erosion often follow.

After years of fighting erosion, the Lakewood Mardi-Gras Association, a nonprofit group which operates the Paul Bunyan Ski Hill in Lakewood, Wis., decided that they needed help. Their high yearly maintenance bills were making it difficult for them to meet their loan payments. They requested financial and technical assistance through the Lumberjack Resource Conservation and Development (RC&D) Area to fight the erosion problem. The Oconto County Soil and Water Conservation District board of supervisors agreed to help because controlling the erosion would benefit the community. They requested a high priority for assistance from the 10-county RC&D board of directors and it was approved.

Paul Bunyan Ski Hill had begun as a small, one rope-tow ski hill for children in the early sixties. At that time, Lakewood, in the heart of the Nicolet National Forest, was a very quiet place from December to April. But a community with a population of more than ½ million was only an hour's drive away. In 1965, members of the Lakewood community, aware of a growing interest in outdoor recreation in the area, decided to expand the ski hill.

To raise money for their expansion project, the association sold membership certificates to 100 local rural people and to 20 people from nearby urban areas. An 11-member board was set up to operate the ski hill. USDA's Farmers Home Administration loaned the association $98,000.

With the money the members had a well drilled, purchased snow-making equipment, installed a T-bar lift, and completed the chalet. They added parking lots to accommodate the increased business.

When they discovered that they needed more land to anchor the new T-bar lift farther back on the hill, association members arranged an exchange with USDA's Forest Service for an adjoining 40-acre parcel of land in the Nicolet National Forest.

The association hired two local people to manage the chalet, the food business, and the ski rental facilities and to arrange for the operation of the rope tows, the T-bar lift, and the snow-making equipment. Up to 25 people were employed during the ski season.

While all the operational activities were being carried out smoothly in winter, the battle to keep the gullies from forming in the sandy soils went on each summer.

As the first step in planning erosion control, the Soil Conservation Service made soil surveys and helped the association develop a resource conservation plan. SCS then helped the association develop an RC&D measure plan to control critical erosion. After the plan was agreed to, SCS proceeded with engineering designs.

RC&D financial assistance was

At left, Raoul Schottky (left), Paul Bunyan Ski Hill Board member, and District Conservationist Glenn Garvey discuss treatment for an eroding area. Treatment includes smoothing, adding topsoil, seeding, fertilizing, liming, and mulching. At right, aspen netting was used to protect a newly seeded area beside the main parking lot.

approved by SCS. A performance of work agreement was arranged whereby SCS cost-shared 75 percent of the estimated cost and the local organization contributed 25 percent of the cost by providing labor and equipment. Thus the association's actual cash outlay was minimal.

The plans called for widening the entrance road, seeding and sloping the adjoining roadbanks, and vegetating the eroding back slopes of a parking lot. There were many bare spots on the hill, along the T-bar lift, and in an area where soil had been borrowed to smooth out the hillside. More than 6 acres was seeded. To save labor, seed and fertilizer were spread with a hydroseeder. Lime was spread from trucks and by hand. Chopped straw, mixed with an asphalt emulsion, was blown over the seed as a mulch. The hydroseeder and mulcher were borrowed from the Forest Service. On some of the area, rolls of aspen netting were used as a mulch.

The slope of one of the upper parking lots was more than 6 percent. Each year cars slid into each other as they tried to pull out of the snow-covered parking area. The lot was reshaped to make it more level, cutting down on erosion as well as accidents.

To safely move runoff water down from the top of the wooded hills, through the parking lot, and into a natural seepage field, more than 2,200 feet of stone-lined waterways and a shorter blacktop waterway were constructed. A snowmobile trail, part of a 300-mile system, was reshaped to act as a diversion and channel the water through one of four water control structures. All of the runoff is then funneled into a large pipe drop structure with a heated concrete apron in the main parking lot.

Off-road vehicles such as minibikes, motorcycles, and four-wheel drive vehicles had been using parts of the ski hill and parking areas as a hill-climbing area each summer. Severe gullying had followed in their tracks. To protect the critical areas from off-road vehicles, more than 1,200 feet of ½-inch steel cable fencing was installed. With the deep sandy and gravelly soils and steep slopes, this kind of control was necessary to avoid more gullies.

"Gullies cost money," said Don Bartels, president of the Mardi-Gras Association. "Erosion problems prevented us from using all of our parking facilities and limited our chances for expansion. With the improved parking facilities and with erosion controlled on the hills and the chalet area, we can now handle more skiers. This improvement provides a stimulus to future expansion.

"Besides employing people at the hill itself, we provide many spinoff benefits to the local business people who run the gas stations, motels, taverns, and groceries and other stores. Also, building of new cottages in the area has increased tremendously in the last several years, thereby boosting the construction business."

Bartels, who has lived much of his life in the Lakewood area, concluded, "Northern Oconto County no longer closes down with the last day of deer season. The Paul Bunyan Ski Hill is an outstanding example of an outdoor recreation enterprise that used the natural resource base—that is, the land—to benefit the local economy. We feel that this base is worth protecting."

Mr. Garvey is district conservationist, SCS, Oconto, Wis.

Eroding areas were seeded with a mixture of 'Emerald' crownvetch, 'Empire' birdsfoot trefoil, 'Lincoln' smooth brome, and Kentucky bluegrass. A mulcher blew chopped straw coated with an asphalt emulsion over the seeded areas to protect them. The asphalt emulsion kept the straw from blowing away.

Farm Pond Saves Energy

by Charles F. McCluskey, Jr., and Charles N. Rinehart

A farm pond keeps a house cool when it's warm and warm when it's cool.

The farm pond with its many uses is one of the most popular conservation practices in Ohio. Traditional pond uses include livestock water, irrigation, spray water for orchards, recreation, fire protection, and control of runoff water and sediment. Some Ohio ponds may be taking on a new use: home heating and cooling.

Bob Groves and his family live on a farm near Bellefontaine in Logan County, Ohio. They asked the Soil Conservation Service to help them design a pond for recreation, fish, and wildlife.

"Originally, when we asked SCS for help, we just wanted a wildlife and recreation pond near the house," said Bob Groves. "Then we decided to expand the use of the pond to heat and cool our home."

Special features were added to the original design by an electrical contractor to meet the needs of the collection system for heating and cooling.

Heating and cooling more than 3,500 square feet of living space in the Groves' new home would be no small job. Working with the Groves through the Logan Soil and Water Conservation District, SCS checked the pond site, prepared the pond design, and helped during construction.

A 48-inch, 4-foot-long tile was buried vertically into the pond bottom. The open end of the tile protruded just above the pond bottom and was covered with wire mesh to prevent foreign materials from being sucked in.

Water is pumped from the spring-fed pond through a 1¼-inch plastic intake pipe, which was inserted into the side of the tile below the pond bottom and below frost depth. The water flows through the heating and cooling coils in the Groves' water-to-air heating and cooling pump system, then is discharged back into the pond at the waterline. The process continues upon demand by the central system, through the use of thermostats for each heating and cooling zone in the house.

The initial cost for installing the pond and the pump system is considerably more than that for an oil, electric, or propane system. The Groves' total system cost about $3,500 more, but costs will vary with pond size and pump system.

Bob's wife Judy, convinced that the system would work, said, "We wanted the pond anyway, and the abundant year-round source of water was just too good to pass up. The pump system will pay for itself in about 4½ years at current prices."

The Groves have not overlooked other benefits that their pond provides. Last summer they stocked the pond with bass and bluegill. They are building a dock to make it easier for swimming, boating, and fishing.

Now that the pond is more than a year old, Bob Groves said, "That pond is paying for itself every day in many ways. As utility costs increase, our savings will be greater. And looking forward to summer, the pond area is really a fine place to relax on a hot afternoon."

The Groves' heat pump system using pond water was put to the test last winter and worked fine. The pond provides a beautiful setting for the Groves' new home.

Mr. McCluskey was a soil conservationist, SCS, Somerset, Ohio, and is now district conservationist, SCS, Zanesville, Ohio.
Mr. Rinehart is a soil conservation technician, SCS, Bellefontaine, Ohio.

by Albert Neu

Keeping the Airport in Place

Among the erosion control measures installed at the Winslow airport was a formless concrete chute, which will stabilize the grade and prevent gullies from forming.

Erosion from bare ground around the airport in Winslow, Ariz., created a serious hazard. Wind erosion reduced visibility and left dust hanging in the air for hours. Rapid runoff from summer storms overflowed the runways and carried sediment into the Little Colorado River.

The Winslow City Council became concerned about this continuing problem. Not only did the erosion pose a serious safety hazard, but it also created ugly scars. Use of the airport was somewhat restricted and maintenance and repair costs were creating a financial burden on the city.

The 472-acre airport, located on the city's southside, includes two 7,000-foot lighted and paved runways, hangars, a National Weather Service Station, a Forest Service fire retardant loading depot, an animal shelter, and a city storage area.

The area had been in pasture before it became an airport and had been overgrazed. The sparse stand of plants that was left provided poor soil protection. Sheet and gully erosion reduced the plant cover even after the area was fenced to exclude livestock.

The Winslow City Council presented the erosion problem to the Little Colorado River Plateau Resource Conservation and Development (RC&D) Council and asked for assistance. The city council worked through the Navajo County Natural Resource Conservation District with the Soil Conservation Service to develop a plan for treating the area.

The first step was to make a soil survey. Then, based on the soils information, five possible treatments for the area were proposed. The sponsors selected a combination of two treatments for the severely eroding area which included terracing or pitting and seeding.

Land treatment measures installed included 3,183 feet of diversions and level terracing of about 63 acres. More than 2,300 feet of grassed waterway was constructed along with 900 feet of diversion dike and a 4-foot concrete drop structure. About 143 acres of a severely eroded area was seeded to alkali-sacaton, western wheatgrass, and fourwing saltbush.

The project was constructed in two phases over a 3-year period. City crews performed the work using city-owned equipment.

The city of Winslow provided about $12,000 of the construction costs with the balance of $50,000 being provided by RC&D financial assistance funds.

According to Winslow city officials, the waterways and diversions have already proved their worth. During a number of heavy thunder storms, water runoff and erosion were effectively controlled.

Mr. Neu is RC&D coordinator, SCS, Holbrook, Ariz.

Water Springs Up on the Range

by Kerry Powers

It was dry country in eastern Wyoming until a spring was tapped and water began to flow to the cattle.

Niobrara County's first community stockwater pipeline has been completed and it's running great.

The Van Blarcum Pipeline in northeastern Niobrara County, Wyo., is supplying water to hundreds of cattle on nearly 9,000 acres of rangeland owned and operated by four area ranchers—Dick Tollman, Vernon Chard, Herb Geike, and John Kreman, executor of the Jesse Wolff estate.

The pipeline, named for Tollman's grandfather-in-law, consists of about 65,000 feet of 1¼-inch diameter, 160 p.s.i., plastic pipe and works entirely by gravity flow from a newly developed spring that yields about 12 gallons a minute. There is a 575-foot drop in elevation from the top of the buttes on Tollman's property to the end of the pipeline. Seventeen new 8- by 2-foot fiberglass stock tanks with 1,000 gallon capacity and several existing tanks are being supplied with water year-round, with the farthest tank about 5 miles from the spring development. The pipeline is buried 5 feet below ground to prevent freezing and requires a pressure reducer because of the pressure build-up from the great drop in elevation.

The stockwater pipeline was laid then covered with gravel and soil. Only a small amount of land was disturbed.

Dick Tollman came up with the idea of developing the spring about 15 years ago, but the development wasn't feasible until plastic pipe became more common and he found some willing neighbors. It had been very difficult for the four ranchers to drill usable stockwater wells because water is scarce or too deep. The spring water helps by benefiting the cattle and improving range management.

Technical assistance for the pipeline was provided by the Soil Conservation Service working through the Niobrara Conservation District. Assistance included surveying and designing the spring development and the pipeline.

The participants share the cost of the project based on their share of the benefits. In addition, USDA's Agricultural Stabilization and Conservation Service provided cost-share funding.

Besides improving grazing rotation in the dry country, the water development will eliminate hauling water for cattle, the tanks will keep the cattle from having to walk so far, and the quality of the water will help their weight and health. Tollman said, "When the cattle have enough water to drink, they're going to convert the grass they eat into higher gains."

Throughout the year, unused tanks are shut off, thus insuring an adequate supply of water to the tanks that are being used. Since the spring flows continuously, the cattle will have water to drink during winter. To prevent the tanks from freezing over, according to Tollman, hadites—sections of porous pipe—with insulated lids have been installed around the floats to protect them and keep them from freezing.

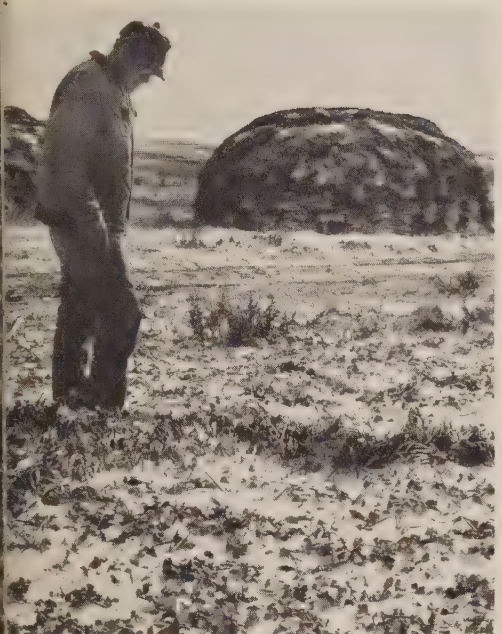
"These stockwater pipelines are a great thing for this part of the country," said Jim Schwartz, SCS district conservationist. "They could benefit any ranch that could use more or better distribution of livestock water and has a good source of water." Schwartz added that the whole range ecosystem will benefit from improved water distribution and proper range management.

Mr. Powers was a soil conservation technician, SCS, Lusk, Wyo., and is now a soil conservationist, SCS, Powell, Wyo.

by Dean White
and Ron Nadwornick

An Unequaled Record

A long-time conservationist in Montana sees "convenience" farming lead to increased wind erosion.



Stanley Nelson checks the regrowth on an alfalfa stand after the first snowfall of the season. His forage base allows him to run cattle throughout the winter.

A Montana man, active in the conservation movement since the 1930's, recently expressed concern that sound conservation practices are being destroyed.

Stanley Nelson made the comments on the anniversary of 37 years of service as a supervisor for the Wibaux Conservation District—the first district organized in Montana. He served on the first board of supervisors and ever since, and his length of service to the conservation movement is unequaled in the State.

Nelson estimates that more than 10,000 acres of grassland has been converted to cropland in Wibaux County in recent years. Much of this land is marginal cropland and is more susceptible to wind and water erosion than when it is left in grassland.

According to Nelson, one reason for plowing marginal cropland is financial gain: Cropland sells for $100 to $200 an acre more than rangeland.

Nelson estimates that 20,000 acres of contour strips and field strips have also been taken out in the last 10 years and that over 100 acres of grassed waterways have been removed.

The reason for this destruction, Nelson notes, lies in convenience. New tractors can pull equipment that is 40 to 60 feet wide. Contour strips, field strips, and grassed waterways hinder the movement of the big rigs. It's easier to farm through them than around them.

The result is block farming. Some fields in the area are farmed in 80- to 160-acre blocks and some are even larger.

Nelson says that the increased wind erosion in the area is attributable to this block farming. "The dust storms around here seem more frequent and worse than just a few years back," he said, drawing on a lot of memories.

The larger the field the harder it is to protect the soil against wind erosion.

But Nelson hasn't given up hope. He firmly believes that "sound soil and water conservation practices are the keys to continued productivity. Practicing anything other than sound conservation is self-defeating and a poor legacy to leave our children."

Not all of the contours, strips, and grassed waterways have been torn up. Over the years the acres converted to these farming methods in the county number in the thousands. And much of the conservation on the land will remain. The dams, wells, and spring developments will continue to provide livestock water and the crossfences will help improve grazing distribution.

Nelson sees changes in conservation and knows his role—advocate the sound practices. His knowledge and unequaled record of service to conservation in Montana make Nelson a man whose time-tested advice is worth following.

Mr. White is district conservationist, SCS, Sheridan, Mont.
Mr. Nadwornick is district conservationist, SCS, Whitehall, Mont.

Trefoils: Backbone of Erosion Control

Three tough trefoils pass erosion control test.

by Jack Carlson
and Stan Swanson

The Pacific Northwest, west of the Cascade Mountains, abounds with rich, green forests, tall conifers and hardwoods, lush understory herbs and shrubs, and dense riparian zones. Plants seemingly spring from the ground with the abundant rainfall—a horticulturalist's paradise. Why, then, are plants needed for reducing erosion? Natural revegetation surely takes care of it all. There's probably very little erosion. Right? Wrong!

Road construction and other kinds of drastic soil disturbance contribute more than 5 million tons of sediment each year in western Oregon and western Washington. Of this, more than 2,000 miles of new logging road construction contributes up to 3½ million tons each year. Steep, south-facing, infertile roadcuts—eroding more than 200 tons per acre annually—permit, at best, only thin stands of native plants to gain a foothold.

Tough, new plants are needed and have been found. Three of the most important are trefoils, extensively tested by the Soil Conservation Service plant materials center at Corvallis, Oreg., and now available for use in revegetation projects.

Birdsfoot trefoil (Lotus corniculatus) is a long-lived, erect-growing perennial legume that persists well on road cuts in the northwest. The varieties 'Cascade' and 'Granger' have deep, branching taproots making them especially suitable for droughty sites. They are compatible with perennial grasses and rapidly developing, short-lived legumes. Birdsfoot trefoil is a key ingredient for maintaining cover on infertile sites because of its persistence and ability to fix nitrogen.

Dwarf English trefoil (Lotus corniculatus var arvensis) is similar to birdsfoot trefoil. 'Kalo', a variety released in 1976 by SCS and the Oregon and Washington Agricultural

For 9 years, 'Cascade' birdsfoot trefoil has sent out its branching roots into this roadcut, providing nitrogen and maintaining a good grass stand.

Experiment Stations, has short rhizomes and flowers profusely, making it ideal for roadside plantings. It is darker green and lower growing than Cascade and Granger trefoils, and is also well adapted to adverse sites. The low, spreading habit of Kalo dwarf English trefoil enables it to maintain dense stands even when heavily browsed by deer.

Big trefoil (Lotus pendunculatus) is also long-lived, adapted to acid and low-fertility sites, but thrives on wetness. Strong rhizomes enable it to spread rapidly. 'Marshfield' was released by SCS and the Oregon and Washington Agricultural Experiment Stations in 1972. It is semierect, dark green, and has distinctive red coloration on its stems and leaf margins.

Generally, Marshfield big trefoil performs best in the coastal zone where precipitation averages 60 inches or more annually. In lower precipitation zones of western Oregon and western Washington, Kalo, Cascade, or Granger trefoils usually perform best. In the below-60-inch precipitation zone, big trefoil can be added to mixtures containing dwarf English or birdsfoot trefoil to assure adequate cover on seepy areas of road cuts and fills, as well as along the lower portions of streambanks.

Kalo, Cascade, and Granger trefoils are known to be cold hardy. But Marshfield big trefoil has not yet been adequately tested in the high precipitation zone of the Cascade Range. Trial seedings are underway to compare Marshfield with 'Kaiser' big trefoil in the Cascades. Kaiser, a midwestern variety, is assumed to be cold tolerant.

Studies at the Corvallis Plant Materials Center and at problem site test areas show trefoils to be the backbone of successful seed mixtures. Rapid-developing grasses and legumes—such as dwarf intermediate wheatgrass, ryegrass, and sub-clover—can provide quick cover. White clover and sub clover produce ample nitrogen but must have special management to persist. Slow-developing, long-lived grasses—such as creeping red fescue, orchardgrass, and timothy—decline sharply in vigor and density as nitrogen is depleted.

But with the addition of trefoil, and occasional phosphorus applications, long-lived grasses maintain their vigor and density, and the trefoil persists indefinitely. Not only does trefoil remain green throughout the spring, summer, and fall, but during summer months it produces a profusion of attractive yellow flowers.

Mr. Carlson is a plant materials specialist, SCS, Spokane, Wash.
Mr. Swanson is manager, plant materials center, SCS, Corvallis, Oreg.

Foundation seed of 'Cascade' as well as 'Kalo' and 'Marshfield' trefoils is available to seed producers from the plant materials center, Corvallis, Oreg.

Counting on You

SCS employees, did you know that your productivity is measured? Did you know that it is compared to that of other U.S. Department of Agriculture employees and other Federal Government agencies? Did you know that what you do makes a difference?

by William G. Hance

In September 1970, Senator William Proxmire, then a member of the Congressional Joint Economic Committee, urged the Comptroller General to investigate the feasibility of measuring the productivity of the Federal Government. Subsequently, the General Accounting Office, the Office of Management and Budget, and the Civil Service Commission—with the assistance of the Bureau of Labor Statistics—began a Federal productivity measurement effort.

During fiscal year (FY) 1972, 17 agencies, including the Soil Conservation Service, submitted input and output data for FY's 1967 through 1971. By FY 1977, 66 percent of the Federal work force was included in productivity measurement.

SCS has been measuring time and progress since 1936. SCS State conservationists and area conservationists have used the measurements to varying degrees to determine staffing and other management needs. Thus, SCS had input-output information on hand when the first productivity data were requested.

What Is Productivity?
Productivity is the ratio of outputs to inputs. Outputs are stated in units of products, such as cars manufactured, acres plowed, or chickens plucked. Input is labor expressed as employee years or labor costs.

Productivity is expressed as: Output per employee year or output per "X" number of dollars.

What Is a Productivity Index?
A productivity index is the relationship between productivity (output per employee year or "X" dollars) for a selected time period and productivity for a selected base period. The productivity index is usually expressed as a percentage with the base period being 100.

For example, if the FY 1978 productivity were 15 percent higher than the FY 1972 base year, the 1978 index would be 115.

Productivity Comparisons
The Federal Government's productivity measurement is combined with productivity measurement in private industry for an estimation of national productivity.

The U.S. Department of Agriculture can be compared to private nonagricultural industry because of similarities in output and input requirements.

Because it is primarily a service organization, SCS is compared with

How Does SCS Measure Up?

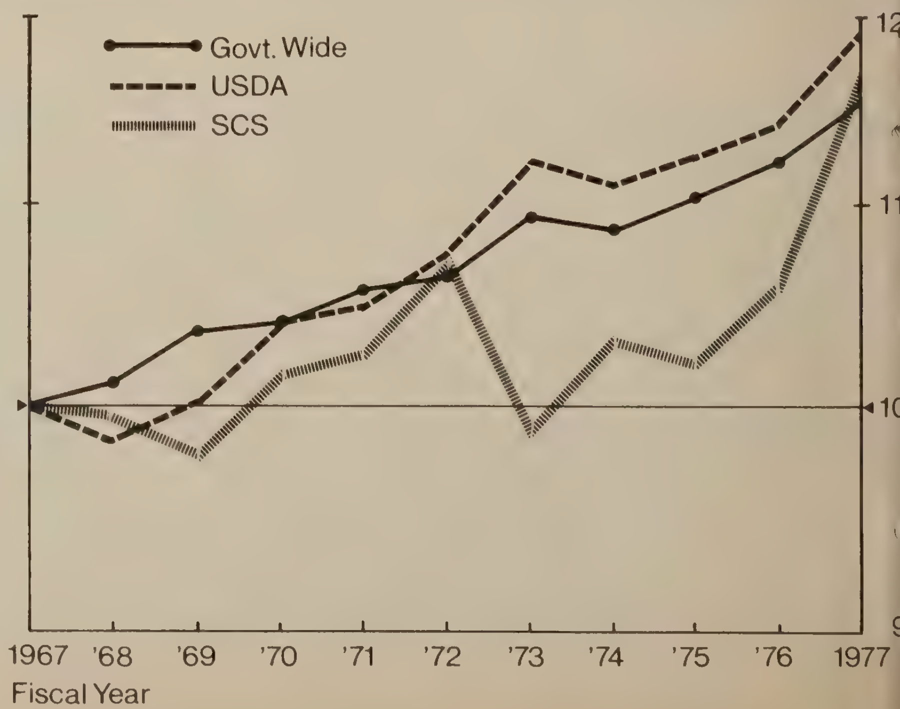
Productivity Index, Output per Employee Year

Federal Government

U.S. Department of Agriculture

Soil Conservation Service

Fiscal Years 1967–1977



This graph compares the productivity index of the Soil Conservation Service with USDA and Federal Government productivity.

Source of graphs:

Bureau of Labor Statistics U.S. Department of Labor

the portion of the nonagricultural sector that deals with service only, such as insurance, consultants, and hotels.

What Is Measured in SCS?
Virtually all employee time is included in SCS productivity measurements. Conservation operations (CO), for example, is divided into several financial projects. CO time input is assigned to specific outputs and each input-output element contributes to the SCS productivity index.

The FY 1977 SCS measurement included 21 separate measurement items. These varied from flood hazard studies with 55 employee-years input to conservation operations technical services with 8,979 employee-years input. SCS excluded only foreign assistance time from the productivity effort.

Factors Affecting Productivity
Three types of factors affect productivity: (1) people factors—including skills, knowledge, and motivation; (2) process factors—including technology, procedures, and legal constraints; and (3) product factors—including changes in quality or complexity of the product.

SCS employees need to consider each of these factors to determine where productivity problems exist or where improvement can be made.

Improving Productivity
Improving productivity is necessary to: help combat inflation, maintain public confidence, meet new priority demands with limited funds, and give employees a sense of accomplishment. The way to increase productivity is to boost individual worker output. An employee's first responsibility is to increase his or her productivity. SCS line officers, for example, are responsible first for effective use of their time and then for improving their staffs' productivity through management efforts such as training, improving work organization or procedures, and capital investments. Improved productivity is a proof of the effectiveness of management at any administrative level.

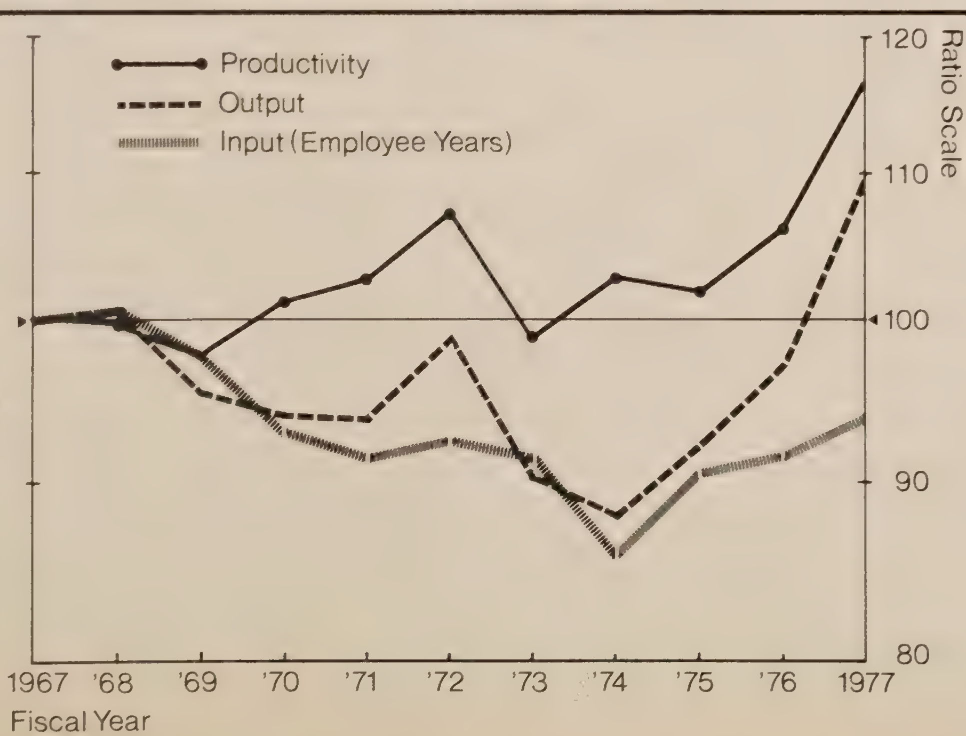
Mr. Hance was a management analyst, Management Evaluation Division, SCS, Washington, D.C. He is now a soil conservationist, Inventory and Monitoring Division, SCS, Washington, D.C.

Productivity, Output, and Employee Years

Soil Conservation Service

Fiscal Years 1967–1977

This graph shows the input and output indexes that make up the SCS productivity index. Note that an increase in personnel does not necessarily result in an increase in productivity nor does a decrease in personnel necessarily result in a decrease in productivity.



Tree Bank for Stevens County

by Branislav Lalich

Land bank, soil bank—why not a "tree bank"? Clark Hedrick, tree committee chairperson for Stevens County Conservation District in Washington State, thought of the project 2 years ago as an outgrowth of the district's tree planting program.

Each spring for several years, under the tree planting program, the district has donated several hundred seedlings to local schools for celebration of Arbor Day. Local Department of Natural Resources people help the school children plant the trees and celebrate America's national tree day.

To augment this program, Hedrick suggested that blue spruce and Scotch pine be set aside to establish a "bank" with a local nursery. The district would provide the trees and the nursery would care for them until they were 4 years old.

To establish the tree bank program, the district signed an agreement with the Colville Floral Nursery. The nursery agreed to provide space, care, and labor.

The district provides 400 blue spruce and Scotch pine, and pays for the pots, potting material, and fertilizer. When the trees are ready for transplanting, the nursery receives 10 percent of the surviving trees. After 1 year under slats, many of the trees have grown to more than 2 feet in height.

Nursery trainees place potted pine trees outdoors. These trees will be ready for donation under Stevens County Conservation District's tree bank program in 1982.

When large enough, the trees are offered to civic organizations, clubs, Scouts, and schools at no cost. The only requirements are: planting can be used only for conservation or beautification; trees must be planted correctly in suitable soils; and proper care must be given to them after planting. Trees are provided only for public use. The district also provides guidance in planting trees and choosing good planting situations.

The program is so successful that Hedrick has arranged to increase the tree bank to 500 seedlings. Trees that have already been donated will be replaced.

To establish a balance between evergreens and broadleaves, the new seedlings will include caragana, sycamore, maple, European mountain ash, green ash, and Russian olive. Fir, spruce, and pine will bring the bank up to the 500 limit.

Colville Floral Nursery, under the management of Jane Armstrong, not only grows and sells flowers and shrubs, it also trains handicapped people in horticultural techniques, floral arrangements, and other skills needed in greenhouse and nursery work. The tree bank will offer another training opportunity for these people.

District Board Chairperson Lewis Lundy said he is pleased with the district's conservation effort, which has already stimulated several requests from civic groups for trees.

Mr. Lalich is a soil conservationist, SCS, Coleville, Wash.

SCS on Display

A permanent exhibit framed in the doorway of the Soil Conservation Service State Office in Des Moines, Iowa, lets people know about SCS. Located across from the cafeteria in the downtown Federal Building, the full-color, back-lighted display says: "Soil Conservation Service, a soil and water conservation agency of the U.S. Department of Agriculture . . . helping people plan and apply conservation practices to the land to keep Iowa's soil productive, its water clean, and its people prosperous."

The 10- by 7-foot exhibit was built by a private contractor and cost about $2,100, including the color transparencies. From the day it was installed, report SCS employees, people stopped referring to the office as "USDA" and began calling it the "Soil Conservation Service."

Cowboy Preacher

by Gene Warren

A retired preacher ministers to rangeland.

To see Seth Baggett galloping across the piney woods in Allen Parish, La., on his spirited quarter horse, you wouldn't think he is 76 years old and a retired preacher. Well, he is and will tell you that following close behind his love for God and people is his love for the land.

Baggett began married life trying to make a living following a mule on a small farm in Allen Parish. "I was doing pretty good until 1926 when I followed the call of God and laid down my plow and went off to the Moody Bible College," he said.

Baggett spent 50 years pastoring churches in and around Allen Parish, but his love for the land remained strong.

After Baggett retired, he went into the cattle business. "I am raising beef for the Lord," he said. "Each year we have several hundred people at our Bible Conference and Mission Camp, and homegrown, cheaper beef comes in handy. This piney woods grass is making it possible."

Baggett leases about 3,000 acres of pine and hardwood land owned by four timber companies in Allen Parish. Realizing he needed to manage the range grass for more and better cows, Baggett became a cooperator with the Calcasieu Soil and Water Conservation District. He worked with James Guillory, Soil Conservation Service district conservationist, to develop a conservation plan for the rangeland.

When Guillory and Jack Cutshall, SCS range conservationist, agreed to take a look at Baggett's rangeland, Baggett invited his neighbors and members of a Future Farmers of America chapter to share in the information. More than 70 people turned out to hear about improving the range.

Seth Baggett rides range every day to keep track of his cattle. He uses conservation practices such as deferred grazing and pasture rotation to improve his herd.

While going over the range with Baggett, Cutshall and Guillory pointed out that cows like some grasses better than others. "That means," Cutshall explained, "that cows will hunt out the best grasses and leave the poor ones. If too many cows are on the range, sooner or later the best grasses are eaten out of existence."

Baggett figures that with the right practices, he will wind up raising a 90 percent calf crop at weights of 450 to 500 pounds—about 12,000 more pounds of beef each year from the same number of cows.

Cutshall and Baggett both say that it will take about 4 years to achieve this goal. Practices such as deferred grazing to revive the good grasses, relocating feeding areas, and pasture rotation are priority jobs for herd improvement.

Baggett said he isn't necessarily interested in increasing the number of cows but wants his present herd to be the best and one that will give him good calves with the least expense.

"The way I figure it, I can handle this herd with my good ol' horse," Baggett said. "With his help and the help of the Lord, we are going to make this piney woods grass put on a lot of good beef for God's children."

Mr. Warren is public information officer, SCS, Alexandria, La.

Conservation Highlights 1978

Summary of Activities of the Soil Conservation Service for Fiscal Year 1978

In fiscal year 1978, the Soil Conservation Service (SCS) of the U.S. Department of Agriculture (USDA) helped farmers and ranchers apply minimum tillage on more than 4 million acres, use planned grazing systems on almost 9 million acres, and manage and conserve irrigation water on more than 2 million acres.

SCS helped landowners install 23,000 miles of terraces and nearly 500,000 acres of stripcropping during the year.

Critical area plantings were made on 409,000 acres to stabilize the soil, reduce sediment damage to downstream areas, and improve wildlife habitat.

SCS provided technical assistance to landowners with the installation and care of 7,266 acres of commercial fish ponds.

The number of agricultural waste management systems and the acreage of farmstead and feedlot windbreaks, grassed waterways, and tree planting also increased during the year.

Resources Conservation Act

The Soil and Water Resources Conservation Act (RCA), which became law on November 18, 1977, will guide the future of USDA's conservation programs. In fiscal year 1978, work was begun to complete the appraisal of the Nation's soil, water, and related resources. SCS conducted nearly 8,500 State and local level meetings attended by 155,500 people to obtain public views on resource conservation problems.

Rural Clean Water Program

Final rules and regulations for the Rural Clean Water Program (RCWP), prepared by SCS cooperatively with the Environmental Protection Agency, and the final environmental impact statement for the program were developed in fiscal year 1978. The Clean Water Act of 1977 authorized cost sharing through the RCWP to farmers and ranchers to establish and maintain best management practices for reducing agricultural related pollution of streams and lakes.

Rural Abandoned Mine Program

Final rules and regulations for the Rural Abandoned Mine Program (RAMP), established by the Surface Mining Control and Reclamation Act of 1977, were published on September 28, 1978. SCS will provide technical and cost-sharing assistance to land users in reclaiming rural non-Federal land damaged by surface mining for coal. Other USDA agencies, the U.S. Department of the Interior, State and local governments, and soil and water conservation districts also will cooperate in RAMP.

Pasture and Range Conservation

SCS helped farmers and ranchers with more than 2 million acres of pasture and hayland plantings. The agency also helped ranchers reseed more than 280,000 acres of range and use brush management on 2.3 million acres.

Woodlands and Windbreaks

SCS provided technical assistance to landowners in planting nearly 413,000 acres of trees, nearly 22,000 acres of farmstead and feedlot windbreaks, and more than 2,500 miles of field windbreaks. SCS helped landowners prepare 278,515 acres for planting or seeding forest crops and practice improved harvesting on an additional 915,700 acres in fiscal year 1978.

Agricultural Conservation Program

During the year, SCS provided technical assistance to 191,930 farmers and ranchers participating in the Agricultural Conservation Program.

Great Plains Conservation Program

In the 10 Great Plains States, 1,702 farmers and ranchers signed long-term contracts to apply permanent conservation measures on 4.1 million acres.

Conservation Help for Units of Government

SCS assisted 25,406 local and State governments with area planning during the year. SCS also prepared more than 15,000 natural resource inventories and evaluations to be used by local governments in developing quality standards for conservation land use and treatment.

Soil Surveys

In fiscal year 1978, 92 soil survey reports were published and an additional 80 survey manuscripts with accompanying maps were sent to be printed. More than 57 million acres were mapped during the year.

Snow Surveys

SCS snow surveyors in the West took more than 40,000 measurements of snow and other precipitation, temperature, and soil moisture during the year and issued 3,885 water supply forecasts. More than 200 of the 500 planned automated data sites were operational.

Plant Materials

SCS plant materials centers released 17 new conservation grasses, legumes, wildflowers, shrubs, and trees to seed growers in fiscal year 1978. The plants will be used to stabilize critical areas, reclaim surface mined lands, control wind erosion, improve range and pasture and wildlife habitat, and prevent nonpoint source water pollution.

Recreation and Wildlife

SCS provided technical and financial assistance for establishing or expanding 602 public recreation developments during the year. SCS also assisted more than 11,000 private landowners in developing commercial and noncommercial recreation facilities.

SCS helped landowners convert more than 200,000 acres from other uses to wildlife and recreation areas and improve 14.7 million acres of land and water for wildlife. The nearly 40,000 ponds installed with SCS assistance also benefit wildlife.

Small Watershed Projects

During fiscal year 1978, 24 more small watershed projects were completed, bringing to 474 the number completed since the program began in 1954. These Public Law 566 projects combine conservation measures and structural and nonstructural measures to reduce flood damage and provide agricultural water management, municipal and industrial water, recreation, and wildlife habitat.

Emergency Assistance

Under Section 216 of the Flood Control Act of 1950, about $42 million was obligated for emergency restoration work to protect life and property in 30 States.

Environmental Services

In addition to preparing its own environmental impact statements, SCS commented on 471 environmental impact statements for other agencies and cooperated in numerous environmental assessments throughout the Nation.

Flood Plain Management

SCS completed 76 flood hazard studies in 28 States during fiscal year 1978. Through the studies, SCS provides information on managing flood plains to local governments and provides information needed by the U.S. Department of Housing and Urban Development in determining flood insurance rates.

SCS issued draft rules and regulations which emphasize the agency's role in providing leadership in the wise use of flood plains and revised flood hazard studies to identify the value of flood plains in their natural state.

River Basin Studies

Through the River Basin Program, SCS has USDA leadership for water and related land resource planning assistance to Federal, State, and local governments. SCS also leads USDA participation in Water Resources Council interagency studies.

Colorado River Basin Salinity Control Program

Under Public Law 93-320, SCS is cooperating with the Bureau of Reclamation to reduce salt concentration in the Colorado River, primarily by improving onfarm irrigation water management. Under Title I of the act, the major practices installed include land leveling, ditch lining, and structures for water control and measurement. Title II salinity control studies were going on in seven areas covering some 605,000 acres of irrigated land, plus thousands of acres of non-Federal dry cropland and range.

Resource Conservation and Development Areas

During fiscal year 1978, work continued in the 178 areas authorized for assistance under the Resource Conservation and Development (RC&D) program. No new areas were authorized for RC&D assistance.

Summary of Progress Fiscal Year 1978

Reportable progress in soil and water conservation programs assisted by the Soil Conservation Service

Metric Conversions
To assist readers, information in the tables is given in metric and in units of common measure. A hectare is equal to 2.471 acres; a kilometer is equal to 0.6214 mile.

Progress Item		Fiscal Year 1978	Cumulative to Sept. 30, 1978
Conservation Plans and Related Services			
District cooperators	No.	60,846	2,211,087
	acres	21,280,684	777,714,497
	hectares	8,612,080	314,733,280
Services to land users	No.	2,560,958	—
Individuals and groups assisted	No.	921,381	—
Individuals and groups applying practices	No.	458,585	—
Conservation plans	No.	47,474	1,764,621
	acres	22,608,531	608,933,294
	hectares	9,149,446	246,429,215
Conservation plans revised	No.	22,559	—
	acres	15,611,643	—
	hectares	6,317,875	—
Inventories and evaluations	No.	90,033	—
Federal land units in coordinated conservation plans	No.	27	1,336
Federal lands in coordinated conservation plans	acres	524,020	15,156,069
	hectares	212,066	6,133,510
Conservation Help for Units of Government			
Technical services for area planning	No.	111,263	—
Land use and treatment site plan reviews	No.	23,449	—
Agencies assisted	No.	25,406	—
Resource plans	No.	625	—
Inventories and evaluations	No.	15,890	—
Snow Surveys and Water Supply Forecasting			
Hydrometeorological measurements	No.	40,090	—
Snow survey and water supply forecasts	No.	3,885	—
Resource Surveys			
Resource studies	No.	2,831	5,521
Resource reports	No.	514	955
Soil Surveys			
Soil Surveys	acres	57,590,621	1,424,413,830
	hectares	23,306,348	576,446,033

Progress Item		Fiscal Year 1978	Cumulative to Sept. 30, 1978
Great Plains Conservation Program			
Applications received	No.	2,741	60,863
	acres	7,240,466	119,546,051
	hectares	2,930,144	48,379,091
Contracts signed	No.	1,702	55,944
	acres	4,111,634	104,574,730
	hectares	1,663,937	42,320,348
Contracts terminated	No.	203	3,521
	acres	458,378	4,225,725
	hectares	185,501	1,710,109
Contracts completed	No.	1,868	38,802
	acres	3,770,662	69,372,040
	hectares	1,525,949	28,074,171
Unserviced applications on hand	No.	4,899	—
Agricultural Conservation Program			
ACP referrals serviced	No.	191,930	—
Recreation Developments Established			
Private	No.	11,787	—
Public	No.	602	—
Public Law-566 Watershed Projects			
Applications	No.	15	2,861
Authorized for planning	No.	5	1,774
Approved for construction	No.	11	1,197
Construction starts	No.	5	966
Projects completed	No.	24	474
River Basin Studies			
Initiated	No.	13	158
Completed	No.	14	97
Flood Hazard Studies			
Flood hazard analyses	No.	38	155
Flood insurance studies	No.	38	229
Colorado River Basin Salinity Control Program			
Applications received	No.	47	216
Contracts signed	No.	37	101
	acres	4,931	14,661
	hectares	1,996	5,933
Contracts—structural measures completed	No.	23	54
	acres	3,487	8,420
	hectares	1,411	3,407

Progress Item		Fiscal Year 1978	Cumulative to Sept. 30, 1978
Resource Conservation and Development Areas			
Application on hand	No.	—	64
	acres	—	278,281,000
	hectares	—	112,617,530
Areas authorized for assistance	No.	—	178
	acres	—	755,886,000
	hectares	—	305,899,500
RC&D area plans accepted	No.	—	163
	acres	—	688,901,000
	hectares	—	278,791,340
RC&D measures completed	No.	1,823	13,947

Practice		Fiscal Year 1978
Agricultural waste management systems	No.	2,254
Brush management	acres	2,326,143
	hectares	914,367
Critical area planting	acres	542,124
	hectares	219,392
Farmstead and feedlot windbreaks	acres	21,619
	hectares	8,749
Field windbreaks	miles	2,565
	kilometers	4,128
Fishponds, commercial	acres	7,266
	hectares	2,940
Fishpond management	No.	40,020
Grassed waterways or outlets	acres	100,027
	hectares	40,480
Irrigation systems	No.	13,544
	acres	1,830,862
	hectares	740,932
Irrigation water conveyances	miles	8,554
	kilometers	13,099
Irrigation water management	acres	2,485,455
	hectares	1,005,839
Minimum tillage	acres	4,246,657
	hectares	1,718,580
Pasture and hayland plantings	acres	2,087,622
	hectares	844,840
Planned grazing systems	acres	8,807,512
	hectares	3,564,312
Ponds	No.	39,842
Proper woodland grazing	acres	1,014,106
	hectares	410,399
Range seeding	acres	280,388
	hectares	113,470
Reclamation of surface-mined land	acres	39,136
	hectares	15,838
Stripcropping	acres	498,907
	hectares	201,903
Subsurface drainage	miles	36,543
	kilometers	58,810
Surface drainage	miles	5,124
	kilometers	8,246
Terraces	miles	23,232
	kilometers	37,388
Tree planting	acres	412,820
	hectares	167,064
Wildlife upland habitat management	acres	14,125,146
	hectares	5,716,305
Wildlife wetland habitat management	acres	554,742
	hectares	224,499
Windbreak renovation	acres	7,111
	hectares	2,878
Woodland, improved harvesting	acres	915,700
	hectares	370,575
Woodland improvement	acres	429,161
	hectares	173,677
Woodland site preparation	acres	278,515
	hectares	112,712
Land Treated for Erosion		
Land adequately treated	acres	43,760,852
	hectares	17,709,580

Land Use Conversions		SCS-assisted conversions Fiscal Year 1978
Cropland to grassland	acres	548,273
	hectares	221,881
Cropland to woodland	acres	36,910
	hectares	14,937
Cropland to other uses	acres	71,754
	hectares	29,038
Grassland to cropland	acres	387,246
	hectares	156,715
Any use to wildlife-recreation land	acres	213,991
	hectares	86,600
Woodland to cropland	acres	63,307
	hectares	25,620
Woodland to other uses	acres	72,589
	hectares	29,376

Research Roundup

Contour Furrows Make Deserts Bloom

Contour furrowing increased forage production by 123 percent on arid southeastern Montana rangeland sites during 6 years of tests conducted by USDA's Science and Education Administration (SEA).

Forage production is notoriously poor in this part of Montana because scant precipitation and low soil infiltration rates limit the water stored in the soil. Though contour furrowing is known to increase rangeland soil water, until now its effects on forage production have been unknown.

To learn these effects, Earl L. Neff, SEA hydraulic engineer, and J. Ross Wight, SEA range scientist, at Sidney, Mont., established 16 watershed study sites on saline upland and panspot range. The saline sites were ordinary uplands where salt and/or alkaline accumulations were apparent. Panspots were areas where hard clays or similar materials lie close to or at the soil's surface in shallow depressions.

Half of the watersheds at each site were left in their natural condition and half were furrowed. Over the 6-year study period, contour furrowing increased forage production by 86 percent on the saline uplands and 159 percent on the panspot sites.

The researchers found that the increased forage production was a direct result of increased soil water content. Overwinter soil water recharge on the contour-furrowed saline upland sites was increased 157 percent and 162 percent on the furrowed panspot sites. Higher infiltration on the panspot sites accounted for the differences between the two types of sites.

The contour furrowing increased the soil water by creating additional surface storage, reducing spring and fall runoff, and providing a longer time for precipitation to infiltrate into the soil. Also, furrows increased the amount of snow water trapped and stored for later plant use by 60 percent.

New Laboratory for Soil Erosion Research

Construction of a $3.6 million National Soil Erosion Laboratory should be underway by summer 1979, according to Earl R. Glover, acting regional administrator for agricultural research of USDA's Science and Education Administration (SEA).

The laboratory will be built on the Purdue University campus in West Lafayette, Ind., and should be ready for occupancy by late 1980 or early 1981. The two-story building will provide space for about 15 SEA agricultural research scientists and a support staff of 22.

"There also will be space for cooperating Purdue research and teaching staff as well as graduate students and visiting scientists," Glover said. "We will give special attention to erosion problems on disturbed lands, such as strip mine and construction sites."

Control Evaporation and Save Water, Energy, and Money

The sun saps up to 6 feet of water as evaporation each year in areas of Arizona, New Mexico, and southern California and somewhat less in other warm areas.

That's enough water loss for farmers and ranchers to give a little thought to eliminating some of the evaporation from small ponds and stock tanks to save time, labor, energy, and, of course, water.

Hauling costs, depending upon the area and cost of water, range from $10 to $30 per 1,000 gallons while evaporation control may cost less than $1.50 per 1,000 gallons.

Keith R. Cooley, hydrologist of USDA's Science and Education Administration (SEA), Phoenix, Ariz., has tested several materials that cut evaporation losses up to 100 percent for the area of water covered.

He finds that wax is feasible and easy to work with in hot climates but has tested several other materials including perlite, Styrofoam, butyl rubber, and even floating concrete blocks. The blocks aren't "normal" blocks—the aggregate used is perlite rather than sand or gravel.

Cooley applies the wax by melting and pumping it directly onto the water where it forms a layer about ¼-inch thick. During the study, he used a regular roofing heater to heat the wax but says farmers and ranchers could use any tub or drum to heat the wax and ladle it onto the water surface. In the hottest climates, the wax can be applied as blocks which

melt and form a complete cover. Paraffin wax can be bought from the manufacturer in 11-pound slabs for about 20 cents per pound.

Another way to curb evaporation losses was developed by Allen R. Dedrick, SEA agricultural engineer. He took 3-foot wide strips of ¼-inch-thick foam rubber, glued them together, cut them to form a cover for a stock tank, and floated them on the surface of the water. Small holes were cut in the cover to vent air and let in water. Cost of the foam rubber is about 25 cents per square foot.

Another of Cooley's methods on larger ponds was to sprinkle loose perlite directly from bags onto the surface of the water. On one 53- by 78-foot pond in Arizona, the perlite cut evaporation 20 percent during an 8-month period. Perlite, like other loose materials, has a tendency to stack up on the lee side of a pond when wind velocities are brisk; however, it redistributes when the wind recedes.

Along with saving water, the materials reduced algae in small ponds and tanks by cutting off sunlight and inducing cooler temperatures.

Topsoil Needed for Mine Spoils

Many of the problems encountered in revegetation of surface mine spoils can be solved by covering undesirable spoils with good soil material, according to James F. Power, soil scientist with USDA's Science and Education Administration.

Power said that as little as 2 inches of topsoil applied over spoils increases infiltration of water several times.

Power, stationed at the Northern Great Plains Research Center, Mandan, N. Dak., said the thin layer of topsoil absorbs raindrop impact, reducing the surface sealing effect that normally occurs on sodic spoils. However, 2 inches is of little value in increasing water holding capacity or the fertility of the root zone.

Research with various depths of topsoil added to spoils high in sodium content, which are common in the Great Plains, indicates that about 28 inches of soil is needed to bring production of spring wheat, alfalfa, crested wheatgrass, and native grasses back to original, premined, production levels.

Power warned that results so far are short term. Topsoil thickness may need to be increased somewhat to overcome salt migration upward from the spoil into the topsoil. And such influences as surface erosion and poor drainage at the soil-spoil interface may also become apparent as the research continues. These could indicate a need for thicker applications of topsoil.

"Because the topsoil added to the spoil is so susceptible to erosion, we are studying the feasibility of adding a few inches of water after the soil material is spread and seeding immediately," Power said. This approach would reduce the erosion problem as well as allow seeding during any part of the growing season.

The effects of supplemental watering on stand establishment, plant species competition, survival, and production are also being investigated at Mandan.

On sloping areas, proper land shaping, in conjunction with application of the topsoil, could increase the potential production after mining, according to Power.

"Although the reclamation procedures currently required in most States seem adequate for restoration of plant growth, many problems require additional research. Because these recently developed reclamation techniques have been used for only a few years, the long-term stability of the materials, of the landscapes and surface drainage, and of the perennial vegetation is largely unknown," said Power.

"Much research remains to be done, but the outlook for restoring or enhancing the potential for producing vegetation useful to man seems promising if the technology developed to date is properly used," Power concluded.

Let a Computer Tell You When to Irrigate

Farm irrigation efficiencies, currently averaging about 40 percent, could be increased at least 10 percent over the next decade to stretch our water resources without increasing energy requirements, according to USDA's Science and Education Administration (SEA).

The key to this increase is the SEA Irrigation Scheduling Program which tells farmers when to irrigate and

how much water to use based on soil and weather data fed into a computer. The premise is that the right amount of water applied at the right time will result in maximum quality and production of any given crop.

SEA studies show that farmers who rely on intuition and past experience to determine when and how much water to apply to their crops often waste more than 25 percent of their water. The wasted water reduces yield by flushing fertilizers below plant roots before the plant can use them. Furthermore, neither intuition nor past experience prepares farmers for severe drought.

The scheduling program was first developed by SEA Agricultural Engineer Marvin E. Jensen and Soil Scientist James L. Wright, Kimberly, Idaho, in 1970 and made available to growers in 1971. SEA Agricultural Engineer Dale F. Heerman, Fort Collins, Colo., incorporated rainfall into the schedule and adopted the program to center pivot sprinkler systems.

Acreage being irrigated under scheduling has increased from an initial 100,000 acres in 1971 to more than 800,000 acres in 1977. Currently, scheduling is being used in Nebraska, Kansas, Colorado, Washington, Texas, Arizona, New Mexico, California, Wyoming, and Idaho, but it can be applied in all States where irrigation is practiced.

Cost of the service depends on location, crop, and length of growing season and averages $4 to $5 per acre, which includes periodic field inspection by trained and experienced technicians. Fertilizer savings alone can more than make up for scheduling's expense.

"Farmers report that they can maintain high yields yet reduce nitrogen fertilizer applications by 40 to 50 pounds per acre and in some extreme instances by 100 pounds," said Heerman.

Utility costs will also be lowered by scheduling irrigations during non-peak electrical power periods.

In a typical scheduling service, daily evapotranspiration and cumulative crop water use for a grower's field are automatically updated by the computer using current climatic data. The dates and the amount of the last irrigation or rainfall are fed into a computer which then prints out a daily water use figure for that field and predicts the date the next irrigation will be required and how much water will be needed.

Besides saving water and fertilizer, scheduling frees growers from the chore of checking moisture in the field and allows more time for other management decisions.

Meetings:

March	
3–7	Association for Supervisors and Curriculum Development, Detroit, Mich.
3–8	American Society of Planning Officials, Miami, Fla.
14–16	Hardwood Manufacturers Association, Washington, D.C.
18–20	American Pulpwood Association, Atlanta, Ga.
18–23	The American Society of Photogrammetry, Washington, D.C.
23–25	National Wildlife Federation, Toronto, Ontario, Canada
24–28	North American Wildlife and Natural Resources Conference, Toronto, Ontario, Canada
April	
1–6	American Concrete Pipe Association, San Antonio, Tex.
4–6	Engineering Geology and Soils Engineering Symposium, Moscow, Idaho
22–25	Association of American Geographers, Philadelphia, Pa.
May	
1–3	International Association for Great Lakes Research Conference, Rochester, N.Y.
23–25	Southern Forestry Conference, Memphis, Tenn.
28–June 1	American Geophysical Union, Washington, D.C.

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Soil Conservation

April 1979

U.S. Department of Agriculture

From the Administrator

Waste Management—More Help for Farms and Cities

Few modern conservation problems will be as demanding or as challenging to conservationists in the months and years ahead as the management of organic wastes.

The needs are tremendous. Most of the 800 million dry tons of organic wastes produced annually in the Nation are animal wastes and crop residues. SCS estimates that over 200,000 livestock and poultry operations countrywide need to install modern waste management systems to control air pollution and prevent pollutants from reaching surface waters.

In addition, more cities and communities have begun to recycle municipal wastes. When spread on the land at rates consistent with soil and plant limitations, these wastes are beneficial in controlling erosion, improving the tilth of some soils, and supplying some nutrients. However, when they are applied at excessive rates or when they contain high concentrations of toxic substances, land application can be harmful to the environment. Recycling is not a cure-all for the problem.

The U.S. Department of Agriculture, in a report to Congress last fall on improving soils with organic wastes, cited the value and limits of recycling and the need for more research. SCS has begun a 4-year study jointly with USDA's Science and Education Administration, the U.S. Environmental Protection Agency (EPA), and the Food and Drug Administration to determine background levels of selected heavy metals occurring in various crops and associated soils so that maximum safe levels of these metals can be set. Also, EPA is interested in identifying soils suitable for application of sludge.

Waste management has long been an integral part of the voluntary conservation planning, design, and technical assistance provided by SCS to farmers, ranchers, and communities through conservation districts. By streamlining and refining techniques, we have been able to increase this assistance, and SCS at present helps land users install about 3,500 waste management systems each year.

The safe disposal of organic wastes will continue to rank high on the list of conservation priorities as the States complete plans to control nonpoint pollution of surface waters and when the Rural Clean Water Program (RCWP) becomes operational.

Agricultural waste management would often constitute a "best management practice" eligible for cost sharing when funds become available for long-term RCWP contracts with private land users.

As never before, the Nation will be looking to and depending on conservation districts to seize the challenge and supply the leadership required to cope voluntarily with the complex problems involved in waste management.

Mel Davis

April 1979, Vol. 44, No. 9

Soil Conservation

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Cover:
Anaerobic lagoons are one method for treating animal waste. Other methods are shown in the article beginning on page 10.

Land Application of Sludge

by Jamon Baker

Problems with odors and rising costs of incineration caused Monroe County, N.Y., to look for another way to dispose of its municipal wastes.

Three years ago, residents of Monroe County, N.Y., discovered that incinerating sludge was not a satisfactory method for getting rid of municipal wastes. Homeowners complained bitterly of odors during the summer and taxpayers complained about soaring costs for fuel to run the incinerators.

Through the combined efforts of local officials, and with the help of the Monroe County Soil and Water Conservation District (SWCD), the county began a program to evaluate land application of sludge as a more acceptable alternative to incinerating. Since then, results from tests at the Northwest Quadrant Sewage Treatment Plant have shown that land spreading of sludge may indeed reduce problems of costs and odors for area residents and that sludge can be used to enrich agricultural land.

"The problem started in the 1960's when the plant was built and incineration of sludge seemed the best method," said John Hoff, member of the Monroe County Pure Waters Administrative Board and chairperson of the local SWCD. "Oil to run the incinerators was cheaper then and the plant could be built in a sparsely populated area.

"During the next 10 years, however, Rochester and its suburbs grew rapidly," Hoff continued. "Houses took over what used to be farmland. Fuel became limited and expensive. In fact, during the blizzard of 1976, we couldn't even get the oil to the treatment plant."

The Northwest Quadrant Plant is one of three sewage treatment plants in Monroe County. It serves mostly residential and commercial establishments and processes 11 million gallons of sewage daily. This is the equivalent of 7 tons of dry solids.

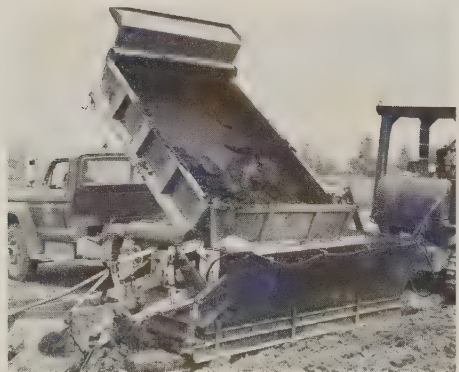
Fortunately, when the plant was built, the county purchased additional land to provide for future expansion. Part of this idle land, a 13.5-acre plot, was selected for the initial land spreading pilot program. Since then it has been increased to include approximately 70 acres of county land.

A local committee was appointed by Lucien Morin, Monroe County manager, to study the problems and work on the land application of sludge. The Soil Conservation Service district conservationist was appointed to this committee to assist with the preparation of a complete soil and water conservation plan on the 225 acres of county land adjacent to the treatment plant. The Monroe County Pure Waters District became a cooperator with the Monroe County SWCD.

The conservation plan included stripcropping, grassed waterways, tile drainage, open drainage ditches, and a retention pond. It also included the crops to be grown according to the season of the year with the appropriate planting rates.

Soil samples were collected to be analyzed for heavy metal concentrations. One of the critical problems in spreading industrial wastes on farmland is caused by a buildup in the soil of heavy metals such as zinc, lead, cadmium, and selenium, which are contained in the sludge. Each soil differs in its ability to adsorb concentrations of these heavy metals. If the soil is overloaded, it becomes toxic and the plants or crops grown on the land will suffer or become toxic for humans and animals who consume them. The concentration of heavy metals was recorded at each step of the application process to insure that the soil didn't become overloaded.

The soil was also analyzed to determine levels of phosphorus and nitrogen. Since the land had not been farmed in a



Far left, sludge is trucked from the treatment plant and dumped into the "sludge sled." Near left, the sled was custom made using a tractor, metal container, moldboard plow, tandem disk, and packer.

long time, nutrient levels were low and the soil could accept large amounts of nutrients to bring it up to acceptable levels for crop production. Nutrient levels were also recorded throughout the sludge application process.

SCS designed drainage ditches to carry surface water runoff to a large retention pond built within the plant fenceline. The pond is used to monitor runoff for possible contamination caused by applying the sludge. Six shallow wells were driven around the perimeter of the test plot to monitor the ground water. This monitoring, performed by the Monroe County Division of Pure Waters, can detect the presence of excess nitrates, toxic metals, bacteria, and similar substances.

According to Jon Pitts, manager of the Northwest Quadrant Plant, it took ingenuity to carry out the land spreading operation.

''We tried spreading the sludge with standard equipment but couldn't get any traction under the wheels,'' said Pitts. ''John Ferranti, our assistant supervisor of mechanical operations, thought he could rig up some equipment. And the next day he came in with the design for a 'sludge sled.' ''

The ''sludge sled,'' as it is known around the plant, consists of a crawler tractor, metal container with an opening in the bottom, a moldboard plow, tandem disk, and packer.

The sludge is spread and plowed down immediately to prevent odors. Compared with the previous method of incinerating the sludge, there is less odor with land spreading and there have been fewer complaints by area residents.

In fall 1976, after sludge application on the sample plot, plant personnel put in winter wheat. The following spring, after land spreading, neighboring farmers planted buckwheat and corn. As the crops were harvested, they were analyzed to insure their safety according to heavy metal concentrations.

Last summer after studying the results of the sludge application, the Monroe County Health Department approved the use of sludge by farmers in the area. Two cooperators with the Monroe County SWCD requested help from SCS to determine in which fields they could safely apply the sludge and what the safe rate of application would be. After spreading the sludge, they planted winter wheat on 40 acres.

Another farmer has requested help from SCS in planning sludge application after seeing how well it worked on his neighbor's farm.

Assessing the economics of land application of sludge is complex. The fuel costs saved by land application rather than incineration can be estimated. Fertilizer costs the farmers save by using the low-cost sludge instead of commercial fertilizers can also be estimated. In addition, there will be a savings in the energy it takes to produce commercial fertilizers if sludge is used, but the labor requirements for the spreading operation have to be deducted from this savings. One benefit of land application of sludge is difficult to place a dollar value on: the reduction of objectionable odors.

''Overall it appears to be economically cost effective,'' said Hoff. ''The results of the experiment at the Northwest Quadrant Plant may help other communities evaluate the pros and cons of land application of sludge.''

Mr. Baker is district conservationist, SCS, Rochester, N.Y.

Sludge is plowed down immediately after spreading to eliminate possible odors. Spreading of sludge is being tried as an alternative to incineration which costs Monroe County as much as $1 million a year for fuel.

District Conservationist Jay Baker (left) and Jon Pitts, manager of the sewage treatment plant, discuss the results of the trial planting of winter wheat on land spread with sludge.

by Anthony J. Esser

Duck Farmers Control Pollution

In response to Federal regulations, Long Island duck farmers are aiming for zero discharge of wastewater and stormwater.

An artificial swimwater was created by building a terrace (right) on sloping land above a natural stream.

At one time, Suffolk County, Long Island, N.Y., was known as the duck capital of the world. However, a rapid increase in land values, high property taxes, and costly pollution control requirements have put many duck farmers out of business. Today on Long Island, only 28 duck farms are still in operation, but they add $80 million a year to Suffolk County's agricultural income.

More than 5½ million ducks are raised each year on Long Island. Waste from these ducks used to be discharged directly into bays and tidal creeks with little or no treatment. But as a result of Public Law 92–500—the Federal Water Pollution Control Act Amendments—and the National Pollutant Discharge Elimination System (NPDES), duck farmers were no longer allowed to discharge untreated waste into these bodies of water.

The New York State and Suffolk County Departments of Environmental Control enforce the NPDES, issuing permits to certify that farmers have met the discharge requirements. The re-

Typically, swimwater from duck pens (near right) is collected in aerated lagoons (far right) where it is agitated. Agitation increases the dissolved oxygen which aids bacterial breakdown of pollutants.

quirements called for farmers, by July 1977, to be able to store stormwater runoff from a 10-year, 24-hour storm event.

Most of the farmers were treating the waste by screening, settling, aeration, and contact chlorination; but they also needed help with diverting clean water around duck pens and feedlots and with plans for storing stormwater.

Farmers turned to the Suffolk County Soil and Water Conservation District (SWCD) for help. USDA's Soil Conservation Service, working through the SWCD, assisted the farmers in developing conservation plans to meet the discharge requirements.

The plans identify the conservation measures needed to divert excess water from feedlot areas, thereby reducing the amount of water needing treatment, and to store feedlot stormwater runoff to prevent untreated or poorly treated wastewater from leaving the farms.

Practices recommended to carry clean water to safe outlets included downspouts and gutters leading to drywells, vertical or French drains, and open ditches and grassed waterways. The plans also provided specifications for duck pen elevations, existing and proposed dike and bulkhead elevations, existing and proposed water elevations, and required and available stormwater storage volumes.

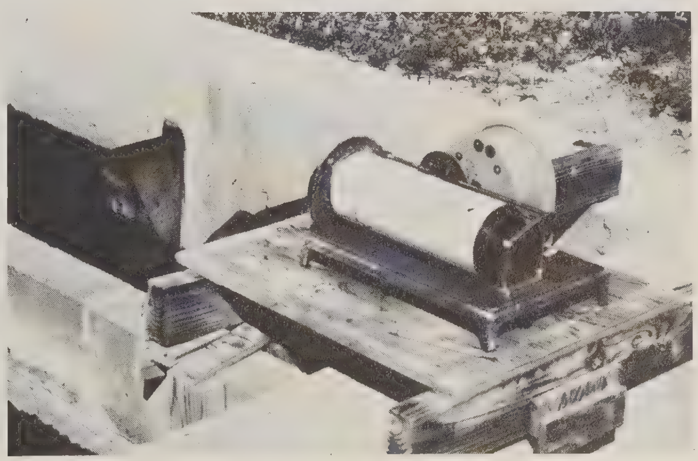
The Suffolk County SWCD was able to provide the duck farmers with an additional service. It made arrangements for the farmers to buy, at a nominal charge, discarded steel dredge pipe from the Suffolk County Department of Public Works. The farmers use the pipe to move swimwater from one location to another, to pipe streams through farms to keep them clean, and to divert clean water around pens, greatly reducing the cost of water management.

By the July 1977 deadline requiring 10-year stormwater storage, all the duck farmers who had requested assistance from the Suffolk County SWCD had either been certified as complying with the requirements or were pending certification while they completed construction. USDA's Agricultural Stabilization and Conservation Service provided financial assistance for installing conservation measures through the Agricultural Conservation Program.

Now that the farmers have met the 1977 requirements, they are looking ahead to 1983. The 1983 regulations require storage of 25-year, 24-hour storm event runoff with 10-day drawdown to normal water. The regulations also contain alternatives for reaching the 1983 requirement of "zero discharge," no discharge of treated duck wastewater or stored stormwater to any surface water body. The alternatives include dryland farming, or raising ducks without swimwater; wastewater recycling; and land application of wastewater using spray irrigation.

The Suffolk County SWCD and SCS are helping the Long Island duck farmers meet the zero discharge requirements by 1983.

Mr. Esser was district conservationist, SCS, Riverhead, N.Y., and is now employed by the New Jersey Department of Agriculture.



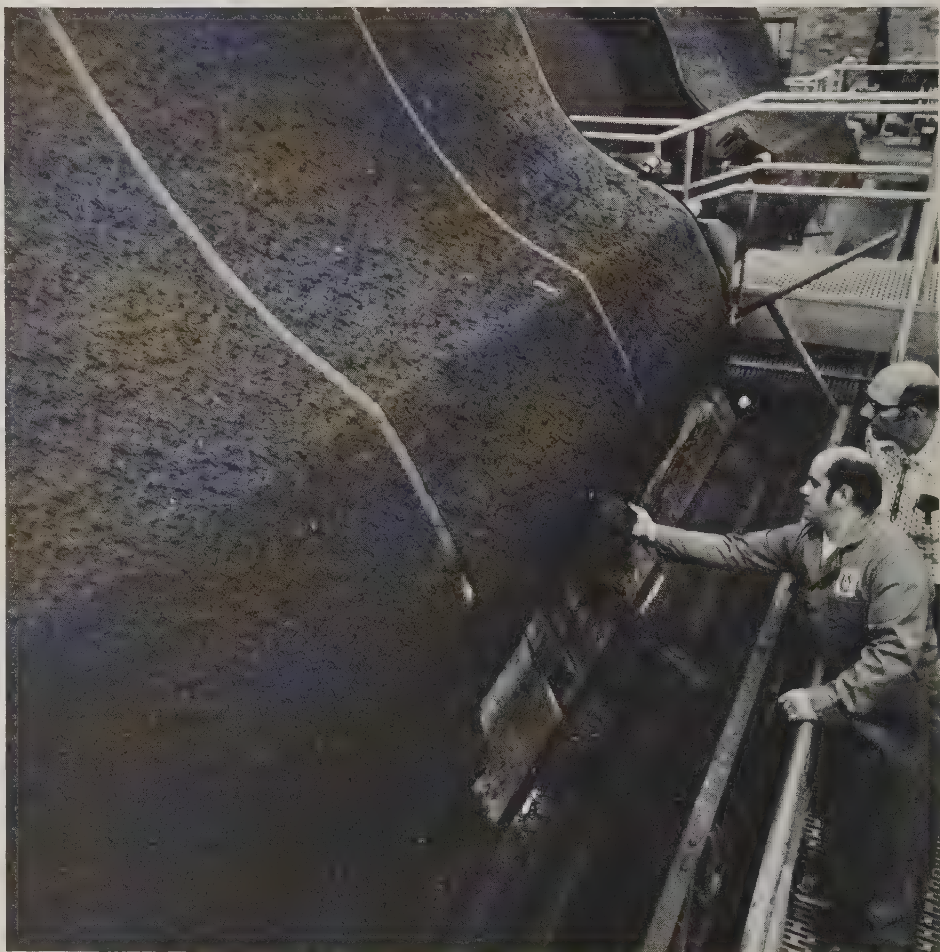
To meet NPDES requirements, duck farmers use discharge flow recorders to measure the amount of discharge from the lagoon systems. The discharge is disinfected in chlorination tanks.

Composting Sewage Sludge

Each day tons of sewage sludge are dumped into rivers, lakes, and the ocean. Environmental and health problems associated with this age-old disposal method require a more effective solution. One of the most promising alternatives is to compost sludge, which is the solid residue left after much of the water is removed from sewage. Composting costs less than incineration and is environmentally sound and esthetic. Compost improves the soil for crops, gardens, and lawns.

Experiments at Beltsville, Md., by USDA's Science and Education Administration, show that composting can be adapted for use on an urban scale. About 50 wet tons of sewage sludge (23 percent solids) is being composted daily on a 15-acre site. An operation of this scale is capable of serving a city of up to 400,000 people. Smaller or larger operations can also be carried out with the same kind of equipment.

An experimental aeration system allows for successful composting even in cold, wet weather without producing obnoxious odors. Temperatures as low as 20° F and rainfall up to 7.5 inches failed to disrupt the Beltsville experiments. Additional tests under more adverse conditions are being made in New England.



Above, sewage sludge mixed with wood chips as a bulking material is composted for use as a soil conditioner, fertilizer, or mulch on a 15-acre test site at USDA's Beltsville Research Center. Scientists are using different chip-to-sludge ratios for composting in windrows or aerated piles. At right, sludge destined for composting rolls off the vacuum filters at the Blue Plains waste water treatment plant near Washington, D.C. George B. Willson of SEA observes as Blue Plains shift supervisor Ed Bobick checks consistency of the sludge. Samples are taken daily and analyzed for acidity, chemical content, and bacteria in compliance with local, State, and Federal laws.

Heat generated during the composting process kills disease-causing organisms. Toxicity to plants from heavy metals was not detected in the compost, although more industrialized communities may have such problems.

Compost's greatest value is as a soil conditioner, increasing the water-holding capacity of the soil and decreasing compactness. It also stabilizes nitrogen in an organic form so that it is released slowly over several years. In many cases, 20 to 25 dry tons of compost per acre can provide all of the nitrogen and most of the phosphorus and essential micronutrients needed for maximum crop yields without polluting ground water with nitrates.

Higher crop yields and better lawns have been produced in experiments with compost. Sod farms and nurseries may also find compost a valuable asset.

This article is taken from Picture Story 294 published by USDA's Science and Education Administration, Agricultural Research.

USDA photos by Robert C. Bjork.

Leaf samples from soybeans and corn fertilized with composted sludge are taken by technicians Timothy W. Palmer and Elizabeth N. Spear. The leaf samples will be analyzed for water, nitrogen, and heavy metals content to help scientists better understand the fertilizer value of composted sludge.

Lush orchardgrass and clover grow on what was once an unsightly sediment-producing strip mine spoil near Frostburg, Md. Composted sludge was applied to the highly acid soil at rates of 25, 50, and 100 tons per acre. Three months after seeding, the spoil was fully vegetated—despite an initial pH of 2.9. Microbiologists George E. Griebel, agronomist Walter H. Armiger, and Maryland strip mine forester Frederick L. Bagley collect forage samples to be analyzed for heavy metals content.

Waste but Not Wasted

There's a $5 billion resource on farms and ranches around the Nation: animal waste.

Nearly 1.2 billion tons of animal waste (175 million dry tons) is produced annually. The value of the nutrients—nitrogen, phosphorus, and potassium—in the waste comes to $4.7 billion, according to a recent U.S. Department of Agriculture report, *Improving Soils with Organic Wastes*.

Many of these nutrients are already being utilized and, with today's technology, considerable additional saving is feasible.

For example, improved management of manure could save an estimated $170 million in nitrogen, according to the report. This would include providing better storage and handling facilities and improving timely incorporation of manure with soil upon spreading.

In addition, more manure can be applied to the land. The report estimates

A farmer in Ohio has constructed a pier-type push off for an animal waste holding pond. The pond capacity is 180-day storage for 100 dairy cattle.

that about 7 million more tons of manure from confined areas, such as feedlots, can be utilized on the land. This would bring the national rate of application from confined areas to 84 percent.

On request, through local conservation districts, the Soil Conservation Service provides farmers and ranchers with information on soils, waste disposal systems, and waste disposal system components, such as waste storage ponds, waste treatment lagoons, and waste utilization.

SCS assistance is aimed at preventing or minimizing degradation of air, soil, and water resources and protecting public health and safety. Systems are planned to prevent pollution of surface or ground water and to recycle waste through soil and plants to the fullest extent possible.

Careful selection of a stacking site for manure can avoid pollution problems.

In Virginia, a hog house overhangs a waste treatment lagoon. Animal waste is mixed with water from a nearby pond and pumped out through the irrigation supply lines to the fields.

Below, raw manure is scraped daily from the corral of this Utah ranch and dropped through the grate into a storage pit. Water is added and the mixture is agitated and pumped into a "honey wagon" for field spreading.

At right, solid and liquid animal wastes are treated in an anaerobic lagoon on a dairy farm in Georgia. The mixture is pumped into carts and hauled to nearby fields and spread.

At right, the "honey wagon" is one of the most common ways to distribute animal waste back onto the land.

At left, animal waste at a large cattle feeding operation in Nebraska is bulldozed into large mounds for drying. The mounds provide a preferred resting place for cattle. Runoff water is collected in a waste storage pond.

Conservation Plus Automation Equals Success

A fast-moving stream of water, recirculated from an anaerobic lagoon, moves poultry waste quickly from one of the Breedlove's three poultry houses.

What do you do with the waste from 50,000 chickens? A lagoon may be the answer.

by Frank Jeter, Jr.

Jerry and Sandra Breedlove have the key to a successful poultry operation: a sound conservation practice—a large waste treatment lagoon—plus automated equipment.

Most poultry operators in eastern North Carolina produce broilers for the frying pan or turkeys for the oven. But the Breedloves of Nash County get young chickens about 8 weeks old and feed them until they're fully grown at 20 weeks.

When the birds "graduate" from the three large, modern poultry houses on the Breedlove's 23-acre farm, they face a future as egg producers and will eventually wind up in canned soup or frozen chicken pot pies.

Before the Breedloves started setting up their poultry operation, they sought technical assistance through the Nash Soil and Water Conservation District from the Soil Conservation Service.

SCS District Conservationist Don Glisson helped the Breedloves design a 3¼-acre anaerobic water treatment lagoon, 6 feet deep. The lagoon is big enough to take care of 56,000 birds, the Breedlove's average poultry population.

Glisson also helped them plan critical area seeding around the lagoon and farm buildings for erosion control.

After the Breedlove's had the lagoon dug, they filled it with water pumped in from a nearby farm pond. They still add pond water occasionally when evaporation lowers the water level. During years when rainfall exceeds evaporation, the Breedloves have arranged to pump lagoon water onto a neighbor's permanent pasture when the ground is dry and will absorb it.

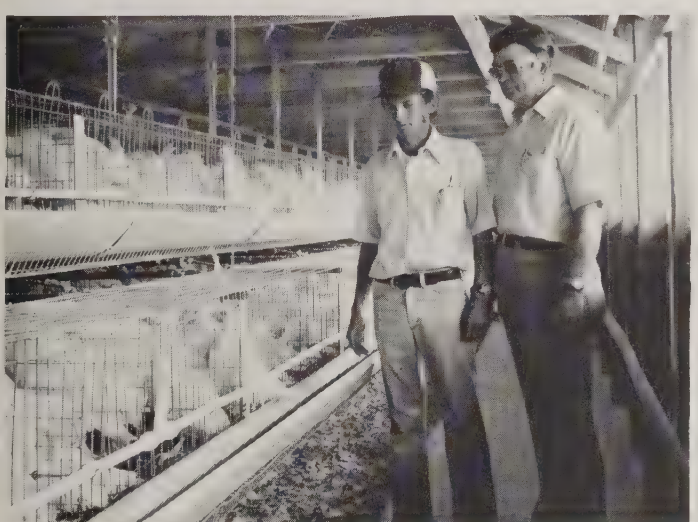
After installing the lagoon, the Breedloves built the three poultry houses and included the newest, most automated equipment for feeding and watering the chickens, who would live in close confinement in wire cages. They put in a flushing system for removal of the tons of manure that would be produced by more than 50,000 chickens.

At the turn of a valve, high-pressure water courses through the concrete troughs beneath the wire cages. Gravity flow through piping and a concrete watercourse carry the water and waste to the lagoon. The lagoon provides 15 cubic feet of water per bird, adequate for the need. It will not have to be cleaned out very often because bacterial action breaks down the waste.

The operation is carried out in cooperation with a grain mill which provides birds, feed, and a market for the mature birds.

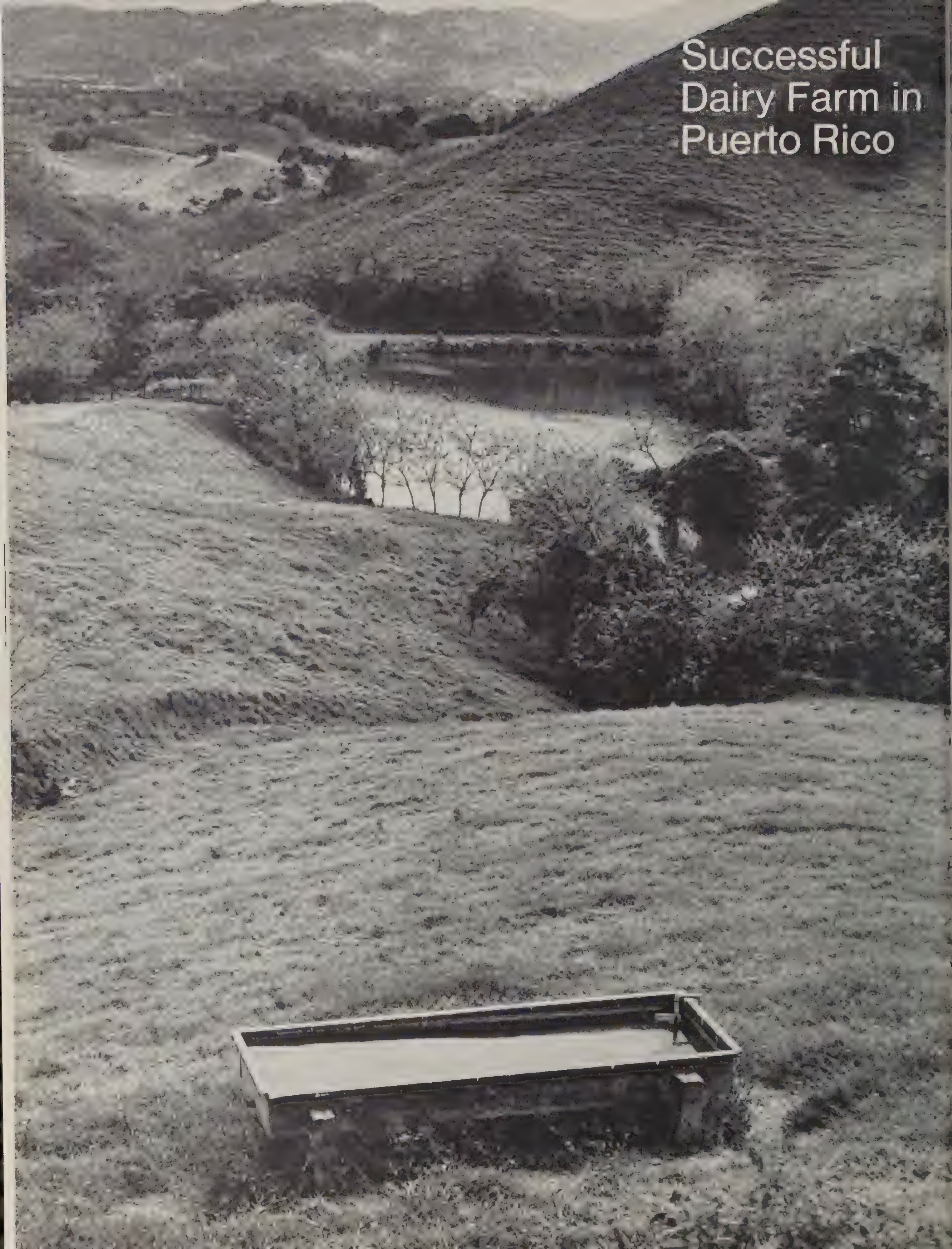
Since 1974, the machinery, houses, and waste lagoon have all worked smoothly. Jerry and Sandra Breedlove, who have two young sons, consider their money-making poultry business an investment for the future.

Mr. Jeter is public information officer, SCS, Raleigh, N.C.



Jerry Breedlove (left) discusses his waste removal and treatment system with SCS District Conservationist Don Glisson. Glisson helped the Breedloves design a water treatment lagoon which would accommodate the waste produced by more than 50,000 chickens.

Successful Dairy Farm in Puerto Rico



Lush grasses now protect once-gullied slopes and provide good grazing for cattle.

by Jorge Z. Rivera-Quiñones

"Hard work and long hours are part of any dairy farm operation," said Myrtha Señeriz, "but you also must use modern conservation methods if you want to stay in the farming business today."

Señeriz is one of the most successful dairy farmers in the hill country of Ward Bairoa-Cagüitas of Aguas Buenas, P.R. She owns and operates a 287-acre, 150-head dairy farm. With her three sons helping, when not in school, and three additional hired helpers, she has increased milk production from 318 to 955 pounds per cow in 3 years.

"Technical conservation planning assistance from the Soil Conservation Service has been a key factor in this improved operation," said Señeriz. "Combining conservation land treatment with properly located structures has benefited me in many ways. I have water for my livestock in each field, erosion control, improved farm roadways, reduced stream pollution from the milking parlor and from sedimentation, improved wildlife habitat and recreation potential, and a more beautiful farm."

Twenty years ago, the Señeriz farm, under another ownership, was planted entirely to sugarcane. As with other hillside sugarcane farms, the steep slopes eroded with the open cultivation. Rich topsoil washed out of the fields to become mud in clogged streams below. Later, under Señeriz's ownership, lush grasses gradually protected the raw gullied fields as they became pastureland for her dairy herd. As a cooperator with the Torito Soil and Water Conservation District (SWCD), she developed a conservation plan with technical assistance from SCS.

Three small ponds, built with SCS engineering assistance, are stocked with bass and bluegill. Other soil and water conservation practices installed on the farm include wells, a spring development, trough and tanks, pipelines, waste treatment lagoon, farm roads and living fences, tree planting, and plantings of stargrass, guineagrass, and pangolagrass.

Señeriz has been a Torito SWCD supervisor since 1971 and the Puerto Rico Association of Soil Conservation Districts recognized her for her distinguished service to conservation districts and for being the best conservationist on the island. She also has won awards from the Chamber of Commerce for her excellent role in agriculture, the Goodyear Tire and Rubber Company for outstanding accomplishments in soil and water conservation, and the Puerto Rico Farmers Association for doing an outstanding job representing Puerto Rican women in the sector of dairy farms.

Myrtha Señeriz hopes to see one of her sons continue her award-winning conservation efforts on the dairy farm.

Mr. Rivera-Quiñones is district conservationist, SCS, Caguas, P.R.

SCS District Conservationist Jorge Rivera-Quiñones discusses dairy farming operations with Myrtha Señeriz. Properly located stock-watering structures and improved pastures are keys to increased milk production.

Help for a Soggy Tree Farm

by Frederick E. Bubb

"To see the land improved was worth more than the money it cost." So stated Woodrow W. Dambach, a cooperator with the Beaver Conservation District and owner of Lake Forest Farms in Fombell, Pa. Dambach made this comment while discussing his recently completed water management project to reduce flood damage.

His 340-acre farm operation includes raising 400,000 Christmas and landscaping trees. The trees grew well on 75 acres of the farm on a highly productive sandy loam soil, which permitted early digging of balled trees in the spring. But the land had one major problem. It flooded often in the late fall and winter months. Low pockets in the fields trapped floodwater and when the water froze, many trees were killed.

"Our loss on that 75 acres went as high as $20,000 in 1 year," Dambach said.

For assistance in solving the problem, he contacted the Soil Conservation Service. Jesse Council, SCS district conservationist, suggested that he install a surface and subsurface water management system.

The water management system consists of 10,800 feet of watercourses which remove floodwater quickly from the field. Culverts and headwalls protect the roadway system which is needed to serve the tree crop. More than 20,000 feet of tile drains carry underground water into the watercourses. The low pockets were filled with spoil from the construction, and the land surface was graded toward the watercourses.

Dambach reported that the project cost him about $10,000. Another $2,500 in cost-share funds was provided through the Agricultural Conservation Program of USDA's Agricultural Stabilization and Conservation Service.

According to Dambach, "We have already increased our useable portion of the 75 acres by 20 percent. On the area we reclaimed, we planted landscaping shrubs and had a 99 percent survival rate where we had trouble growing trees before the project. The project should pay for itself in a few years."

Dambach reported an additional benefit. Because of the increased freedom from flooding, he is now able to convert Christmas tree land to landscaping shrubs, increasing his plant population from 1,900 to 5,400 trees per acre.

"Based on an investment of 50 cents per tree, I am investing a lot more money per acre because I know the project is working," he said. "But my greatest satisfaction is in improving a piece of land. I know that the land will then be available for another generation to use."

Mr. Bubb is public information officer, SCS, Harrisburg, Pa.

SCS District Conservationist Jesse Council (far left) assisted Woodrow Dambach with a water management project on his tree farm. Dambach (near left) checks new plantings of evergreens on drained land. The plantings had a 99 percent survival rate on land where trees had not survived before the project.

Model Ordinance for Erosion and Sediment Control

by Robert J. Brejcha

The Universal Soil Loss Equation plays a leading role in solving mid-America's urban water quality problems.

The Kansas City metropolitan area is suffering from sedimentation. Lake Tapawingo in Jackson County, Mo., offers just one example of the severe siltation facing many lake property owners in the area.

Near right, erosion on this steep grade in Leavenworth County, Kans., was caused by storm water runoff from the paved parking area. Far right, no protection from water erosion was provided at this townhouse development in Wyandotte County, Kans.

In 1974, to help solve countless extreme erosion and sedimentation problems in the Kansas City metropolitan area, the Mid-America Association of Conservation Districts (MAACD) set out to produce a model grading and sediment control ordinance suitable for any unit of government in "mid-America," or anywhere in the country, to follow.

MAACD is made up of eight conservation districts—Cass, Clay, Ray, Platte, and Jackson Counties in Missouri and Johnson, Leavenworth, and Wyandotte Counties in Kansas.

MAACD organized an erosion ad hoc committee which included representatives from private industry, construction firms, interest groups, and government agencies to work on the ordinance. Special assistance came from the Mid-America Regional Council (MARC), a voluntary association established to reinforce and strengthen local governments in the Kansas City region. The association is also a voting member in the Kansas City urban 208 Water Quality Council.

"We had several reasons for developing the ordinance," said former MAACD Chairperson Roy Borgmier of Lawson, Mo., who is now chairperson of the Ray Soil and Water Conservation District. "Naturally we wanted to reduce erosion and sediment damage, but preserving land values and establishing reasonable standards and specifications for erosion control practices were also priorities.

"Local governments are charged with helping States meet Section 208 of Public Law 92–500, the Federal Water Pollution Control Act Amendments of 1972," Borgmier said. When the model ordinance was completed, it was incorporated into the draft of the overall 208 plan for the entire Kansas City metropolitan area.

After receiving public comment on and approval of the ordinance, the MARC board submitted it to the governors of Missouri and Kansas for their sanction. The plan will then go to the U.S. Environmental Protection Agency (EPA) for approval. EPA has supported the ordinance and authorized a printing publication grant for the document which is entitled Model Grading and Sediment Control Ordinance.

"Each conservation district in mid-America now has the job of spreading the word," said Leon Lallier, chairperson of the Wyandotte County Conservation District and MAACD representative. "We must get on with the communication business. Informing officials or jurisdictions is one thing—we want to educate the public as well."

The 208 planning process has been a tremendous education tool. The public has listened and units of government and individuals are responding. For example, Kansas City, Mo., is currently rewriting most sections of its land use planning and zoning regulations and the model ordinance is providing the needed wording for the erosion control section.

In Shawnee, Kans., a family who heard of the new model ordinance used it to persuade the Shawnee Planning Commission to stop construction at a critical site until the development plan was revised to include relevant erosion control standards. The commission now routes all development plans to the Johnson County Soil and Water Conservation District for erosion control re-

Left, a roadside ditch in Shawnee, Kans., has been filled with silt from a nearby construction site. Right, a sediment basin in Independence, Mo., does its job by trapping tons of sediment during construction.

view and comment. The other seven mid-America conservation districts also provide this service.

"The best thing about the ordinance is that it is easy to understand," said Gordon Marking, formerly of MARC.

The model ordinance sets a standard for tolerable soil loss, establishes a procedure for estimating sediment yield from any site, and establishes standards and specifications for applying individual conservation practices.

Developers and private engineers insisted that the model ordinance include standards and specifications for mulching and seeding grass, building sediment basins, and other erosion and sediment control practices used in urban areas.

To provide developers with accurate information on the design, installation, and maintenance of erosion control practices giving the most protection for soil and water resources in the Kansas City region, MAACD adapted the Universal Soil Loss Equation (USLE), developed by USDA's Science and Education Administration and Purdue University.

The ordinance document reads, "An average of 5 tons of soil loss per acre per year will be deemed the maximum tolerable level of sediment leaving a site during development." The ordinance uses the USLE in predicting the average annual soil loss that can be expected from a site under certain conditions.

To make the equation, $A = RKLSCP$, better meet the needs of the ordinance, MAACD added a factor Y. Y is the sediment yield factor. It gives an estimate, in percent, of sheet and rill erosion that will leave an area as sediment. Since sediment is what pollutes the water, ordinance committee members felt such an onsite measurement was needed.

In the equation, A is the predicted average annual soil loss in tons per acre per year; R is a measure of the erosive forces of rainfall and runoff; K is the soil-erodibility factor, for which a constant value of .32 is used in applying the equation to the Kansas City area; L is the slope length factor; S is the slope-gradient factor; C is the plant cover factor, which is the ratio of soil loss from an area with a specific plant or soil cover to that from bare soil; and P is the erosion control practice factor.

Because the R, K, and P factors are considered constant in the Kansas City area, the C factor is combined with them to simplify computations. Other communities considering using the ordinance will need to "fine tune" the USLE for their locales.

MAACD has distributed more than 100 copies of the ordinance to local key officials and has mailed copies to 73 cities in States all over the country. "Our association wants to share the ordinance with the entire Nation," said Leon Lallier. "We think we really have something."

The Model Grading and Sediment Control Ordinance written for the Kansas City metropolitan area is proving to be an important tool which will produce environmental improvements in urban areas for mid-America and, perhaps, the Nation.

Mr. Brejcha is resource conservationist, SCS, Independence, Mo.

A concrete structure proved to be too narrow to handle the runoff from a paved parking area in Johnson County, Kans.

Flax Strips on Fallow Land

Flax stands up to snow and protects fallow land from wind and water erosion.

by Del Schapekahm

"I wouldn't take $10 an acre for removal of my flax strips," said Milton Stiegelmeier, a farmer in Walworth County, S. Dak. "On fallow land, flax strips for erosion control mean profit in my pocket. My soil is protected and I have increased yields."

About 5 years ago, Stiegelmeier, a cooperator with the Walworth County Conservation District, planted strips of flax on all of his fallowed land that was not seeded to rye. He has found that this practice has many advantages. The most important is the protection from wind erosion as soon as the flax emerges. In addition, the flax strips beautify the landscape and help reduce air pollution from dust.

In his farming operation, Stiegelmeier plants two-thirds of his cropland to rye and spring wheat and fallows about one-third of his land. Last year he seeded approximately 400 acres of his fallow land with flax strips.

According to Stiegelmeier, the only significant cost to protect the bare land is the flax seed. He seeds at the rate of ½ to 1 bushel of flax seed per acre, depending on the moisture. The flax acreage can be as small as 5 percent of the field. Certified seed is a must, Stiegelmeier cautions, to insure weed-free seed and good germination. Based on the entire field acreage protected, the seed costs from 30 to 50 cents per acre.

When seeding the flax, Stiegelmeier prefers a pony press drill over broadcasting. The pony press gets the seed into the moisture, firms up the seedbed, and results in better stands.

Planting is done simultaneously with tillage of the fallow—usually late July or early August. This way it is not an extra operation and requires very little time. Some strips are planted 12 feet apart with two rows of flax at 6-inch spacing. Others are 37 feet apart with three rows of flax at 6-inch spacing. Spacing is determined by the kind of tillage equipment being used. With normal moisture, the flax is up in 4 to 5 days.

Stiegelmeier prefers having flax strips on the approximate contour where land is rolling. With tillage and strips on the contour, water erosion is reduced during spring runoff. Wind erosion is reduced as well.

The flax straw reaches full maturity with the fall seeding and usually grows about 28 inches tall. It has a stiff straw and stands up well during the winter, holding snow on the field.

"I don't worry about volunteer flax," Stiegelmeier said, "because the seed is killed during freezing weather."

To till the flax strip, Stiegelmeier removes three shovels in the center of his implement and straddles the strip. This tills close to the flax and controls the weeds. Two or three tillage operations after seeding is common in the area.

Last fall, Stiegelmeier fertilized the flax strips at the rate of 30 pounds of nitrogen per acre. This helped replace the nutrients used by the growing flax and offset the nitrogen immobilized by

Flax strips supplement other conservation measures to reduce wind and water erosion on the Stiegelmeier farm.

soil organisms in the decaying process. Fertilizing was done during the last tillage operation.

"Flax strips alone are not the answer to complete erosion control," Stiegelmeier explained, "but they supplement other conservation measures such as conservation tillage.

"One to two tillage operations can probably be eliminated in the spring when flax strips are used because the land has been protected by snow cover and soil clods have been maintained. This will save fuel and equipment—perhaps $2 an acre depending on the size of the implement."

The benefits far exceed the costs and disadvantages of the practice, according to Stiegelmeier, and he encourages other farmers to use flax strips. Their primary purpose is erosion control, but they also allow cross-tillage of fields since the flax strips are temporary; do not interfere with weed spraying; provide snow fences to hold snow; reduce ground freezing through early snow accumulations which allows better moisture intake; distribute snow evenly over fields; and keep snow clean for uniform, slow thawing. Spring crops will benefit from the moisture saved.

Wildlife benefits, too. The straw provides habitat and food for rabbits.

"Flax strips protecting fallowed cropland can be compared to a windbreak protecting livestock," Stiegelmeier concluded. "There is a feeling of contentment and security knowing you have provided protection."

Mr. Schapekahm is district conservationist, SCS, Selby, S. Dak.

Meetings:

April	
1–6	American Concrete Pipe Association, San Antonio, Tex.
4–6	Engineering Geology and Soils Engineering Symposium, Moscow, Idaho
22–25	Association of American Geographers, Philadelphia, Pa.
May	
1–3	International Association for Great Lakes Research Conference, Rochester, N.Y.
6–11	National Council of State Garden Clubs, Inc., New Orleans, La.
23–25	Southern Forestry Conference, Memphis, Tenn.
28–June 1	American Geophysical Union, Washington, D.C.
June	
3–7	American Institute of Architects, Kansas City, Mo.
4–8	General Federation of Women's Clubs, New Orleans, La.
5–7	The Garden Club of America, Milwaukee, Wis.
17–21	Outdoor Writers Association of America, Albuquerque, N. Mex.
24–28	American Seed Trade Association, Inc., Washington, D.C.
24–29	Air Pollution Control Association, Cincinnati, Ohio
24–29	American Water Works Association Conference, San Francisco, Calif.
29–July 1	National Audubon Society Convention, Estes Park, Colo.

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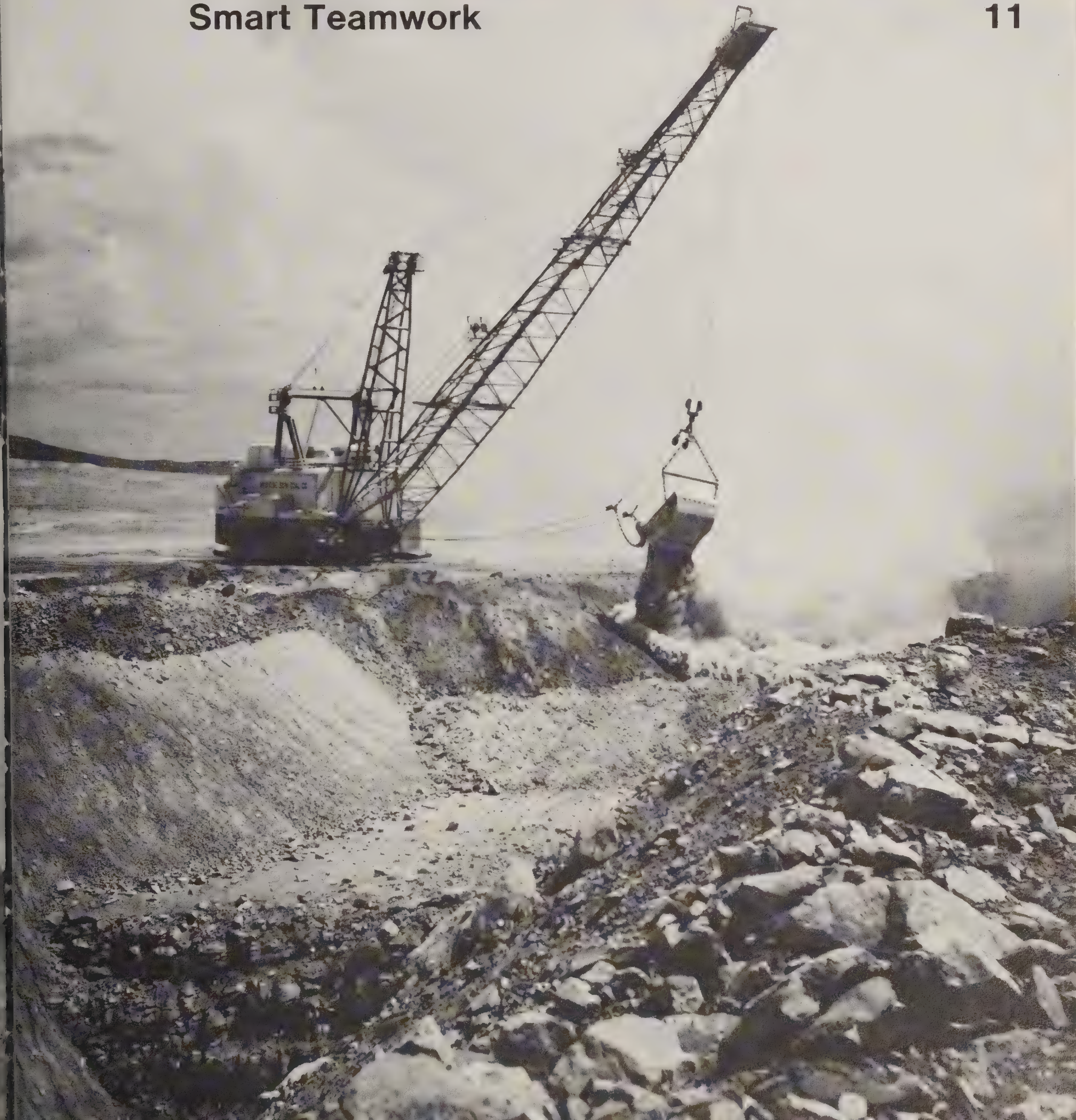

From the Administrator

SCS Employees: "A Cut Above"

Over the past 40 years, more than 60,000 people have at one time or another called themselves Soil Conservation Service employees. This should be considered a badge of honor.

During these 40 years, we have worked together with a common purpose: the conservation ethic of getting conservation on the land. Every task each one of us has accomplished has advanced this purpose.

SCS employees should not be intimidated by today's growing criticism of government employees. I'm certain that this criticism does not apply to the large majority of SCS employees. I have known and worked with many of you over the years and I am increasingly impressed by your dedication, those of you who work out on the land as well as those who work in offices.

You constantly look for better ways to do your jobs. Many of you have given up countless evenings and weekends to attend meetings; to provide technical assistance; to give talks and lectures. Most of you are not clockwatchers, and you are not grudging of your time when people need help in the districts you serve.

We have an agency we can be proud of. SCS is the envy of many organizations. We have a sound organizational structure; a well-defined purpose; an efficient operation; and, most importantly, direct contact with the people we serve. Our job of getting soil, water, plant, and wildlife conservation on the land is one in which all of us can take satisfaction.

I derive satisfaction in knowing that loyal dedication and adherence to our purpose make SCS employees "a cut above" the rest. We can take great satisfaction in knowing that we are making America a better place to live.

We need to continue to show by example that the stereotype many people attribute to the government employee is false. We need to continue to be available to the people who can benefit from our technical assistance. Each of us needs to continue to do the best job we know how to do and to do so with a positive attitude.

Mel Davis

May 1979, Vol. 44, No. 10

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Soil Conservation

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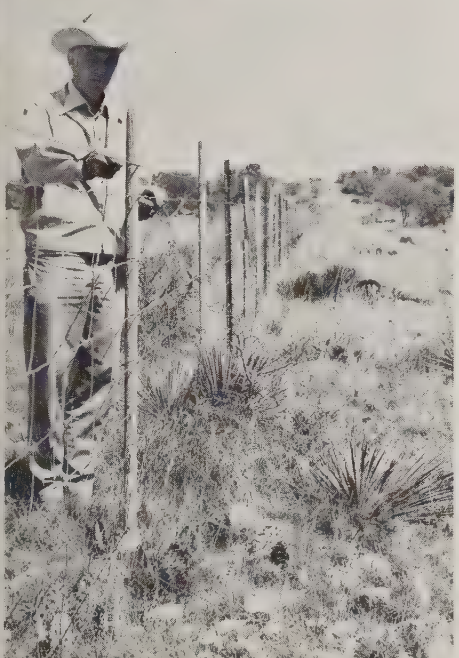
USDA helps make reclamation and land use planning a part of plans for active mining (front) and return previously mined lands to productive use (back). **See article beginning on page 11.**

A Total Approach to Range Management

by Freddie J. Williams
and Kenneth D. Sparks

A short duration grazing system combined with range management and forage analysis keep a west Texas rancher ahead of the weather.

At left, Hereford cows on Powell's ranch cluster under liveoak trees to escape the sun's rays. With large amounts of quality forage in the pasture, the livestock are able to graze their fill and return to shade earlier in the day, which increases animal performance. Below, crossfencing the ranchland before installing the short duration grazing system allowed Powell to simulate conditions in which the rangeland developed. Large herds of buffalo once grazed the area then moved on to greener pastures.



On his 12,000-acre ranch near Fort McKavett, Tex., James Powell combines range management with livestock selection, management, and marketing. As a result, he has almost tripled his stocking rate during the last 20 years.

"In 1942, this ranch was stocked at the high rate of one unit to 9.1 acres, or 70 animal units per section," Powell said. "But the 6-year drought of the 1950's took its toll on the ranch's forage resources and net profits so that by 1955 we had only 21 animal units per section, or an animal unit to each 30 acres.

"When all kinds and classes of livestock and deer were calculated into our 1977 stocking rate, the ranch was supporting 60 animal units per section, or an animal unit to each 10.6 acres," Powell continued.

He runs sheep, cattle, goats, and quarter horses on his ranch; however, sheep and cattle make up about 90 percent of the livestock. He also considers wildlife to be important and manages part of his ranch for deer, turkey, quail, and dove.

In 1964, Powell had an opportunity to observe the success of short duration grazing in an area of South Africa that receives only 9 inches of rainfall annually. In 1965, Powell initiated short duration grazing on his ranch, which receives about 22 inches of precipitation a year.

He fenced his native rangeland into 12 pastures ranging from 300 to 1,300 acres. He installed nine new water wells, 2.5 miles of water lines, and 34 watering troughs to provide livestock with water on each 320 acres.

Powell started his grazing system by grouping sheep and cattle into one herd and rotating them through eight pastures. Even though the range was improving rapidly, he modified his system because of stress on livestock which resulted in lighter lambs and a possible reduction of calf weaning weights. He moved lambing dates to fall and used short duration grazing primarily in the growing season after lambs and calves were weaned.

Powell still uses the same basic grazing system. Four of the rangeland pastures are deferred from about April 15 until September 15. This deferment is rotated between all 12 rangeland pastures in order to give each pasture a full growing season deferment once every 3 years. Each year around April 15, lambs are weaned and ewes are placed in one herd and rotated through eight pastures at about 2-week intervals. Also, cows with heifer calves are grouped in one herd and rotated ahead of the sheep. Steer calves are generally weaned in June or July. At that time, the cows are grouped with the remainder of the cow herd and rotated at 2-week intervals through the eight pastures. The cattle are rotated ahead of the sheep throughout the rotation. Around September 15, cattle and sheep are spread in all 12 pastures.

"This type of grazing system requires considerable flexibility in timing the beginning of rotation and judging the duration of rotation," Powell explained. "As a result of the high stocking rate, more flexibility is also required in adjusting livestock numbers to make up for changes in the weather."

In 1969, Powell, a cooperator with the Eldorado-Divide Soil and Water Conservation District, signed a Great Plains Conservation Program (GPCP) contract with the Soil Conservation Service. Under the program, he con-

verted cropland to pastureland and established bermudagrass, installed a diversion terrace to control erosion in one area, and undertook land leveling for irrigation in a field where he grows forage grasses.

He began a brush management program by dozing mesquite, cedar, and agarito. The dozed areas were then seeded to a mixture of grasses including sideoats grama, Selection 75 kleingrass, green sprangletop, and plains bristlegrass. The seeded grasses thrive alongside the native grasses such as indiangrass, bluestems, and wildrye.

Powell left undisturbed desirable browse plants such as live oak, littleleaf sumac, and hackberry. All brush and cover plants on the tops and steep slopes of the hills were left for wildlife food and cover. Desirable browse along the draws and stream courses, essential for turkey habitat, was also left undisturbed.

Even though his GPCP contract has expired, Powell continues to maintain his conservation practices and improves them every year.

According to Powell, with the coordination of brush management, range and livestock management, and a forage analysis-supplemental feeding program, he has increased the weaning weight of his calves by about 34 pounds. The forage analysis is made by the Texas A. & M. University Agricultural Extension Service. Forage samples are collected at 2-month intervals year round on each of the 12 pastures. During dry or nutritionally stressful years, the samples are taken monthly.

The analysis tells Powell the variations of plant material available for livestock by pasture; the seasonal variations in quality of plant material used by livestock; changes in forage quality from year to year; and the variations from site to site—low stony hills, shallow hills, and valleys. It provides a basis for feeding supplemental mineral and protein.

During the spring of 1978, the forage analysis information proved very valuable. In 1977, Powell's rangeland produced only one-half the forage of the previous year and by early 1978 growth had dropped to only 5 percent of normal. This data along with weather projections for continuing drought indicated a need to reduce livestock numbers or risk damaging deferred grazing areas. Powell decided to reduce his livestock numbers by half beginning in April. Last fall, he began to build up his stock again and will soon be back to the 1977 stocking rate.

Powell's short duration grazing system, range management, and forage analysis have given him the flexibility to change his ranch planning along with the changes in west Texas weather.

In addition to using mechanical brush control on his ranch, Powell is studying biological control. This prickly pear is being attacked by the cactus bug, a parasite that feeds on the plant and could eventually destroy it.

Mr. Williams is district conservationist, SCS, Eldorado, Tex.
Mr. Sparks is range conservationist, SCS, Uvalde, Tex.

Fifteen gallons of water a day are needed for an animal unit to survive. This means that Powell must provide about 16,000 gallons of water every day for his cattle. He has placed water every ½ mile on the ranch. Proper grazing distribution and increased animal performance result.

New Insights on Warm-Season Range Grasses

Scientists are taking a close look at the value of warm-season range grasses for summer forage production in the Northeast.

One of the warm-season grasses scientists are studying in grazing trials is 'Kaw' big bluestem. They found that stems of big bluestem were usually preferred over those of switchgrass. This presents a management problem when both species are in the same pasture.

Most beef farms in the Northeast are short of forage in July and August. So short of forage, in fact, that it determines more than any other factor the size of the beef cow-calf herds in Pennsylvania and neighboring States. In a cooperative effort by scientists in several government agencies, warm-season range grasses are being evaluated for summer forage production.

For many years, Soil Conservation Service plant materials specialists have been strong proponents of using warm-season range grasses for soil conservation purposes. Much effort has been devoted to the collection, evaluation, and selection of germ plasm at several SCS plant materials centers. Scientists at USDA's Regional Pasture Research Laboratory, Science and Education Administration (SEA), University Park, Pa.; the SEA Agricultural Research Center at Beltsville, Md.; and several State agricultural experiment stations are working with SCS plant materials specialists to further evaluate warm-season range grasses for their adaptability to different soils and climates, for establishment characteristics, and their potential for beef production.

Warm-season range grasses such as the bluestems were widespread in the Northeast before the first settlers arrived, indicating that at least some genotypes were well adapted to this climate and to different soils, including droughty and infertile-acid soils. Warm-season grasses generally are more efficient plants, have higher optimal temperature ranges for growth, and produce most of their growth much later in the growing season than cool-season grasses such as timothy, orchardgrass, bluegrass, and fescues.

by G. A. Jung,
C. F. Gross,
W. C. Sharp,
R. E. Kocher,
and L. A. Burdette

Ecologists suggest that the inherent ability of warm-season grasses that enables them to grow at low soil nitrogen levels permitted them to evolve genotypes that were well adapted in the Northeast. But to do this also would require tolerances to the relatively high levels of aluminum and/or manganese in many Northeastern soils. Under field conditions, we found that NY–1145 big bluestem and switchgrasses established in soil that was chemically toxic for the establishment of most cool-season grasses and legumes. Recent laboratory studies at Pennsylvania State University (Penn State) show that warm-season grasses have tolerance to relatively high concentrations of aluminum and manganese, whereas most cool-season grasses do not.

What does all this mean to agriculture? It means that there are grasses available possessing some unusual characteristics: (1) tolerances to some adverse soil conditions that are prevalent in the Eastern United States, (2) fertilizer and lime requirements that are lower than those of the commonly used cool-season grasses, and (3) forage production predominately in summer.

There is much research yet to be done before farmers can take full advantage of warm-season grasses. In our initial efforts to evaluate these grasses, we have been heartened by the high forage yields (see table) obtained at relatively low soil fertility levels (pH 5.3, low phosphorus, and no nitrogen fertilizer). However, after 3 years grazing with beef cattle in southwestern Pennsylvania, yields of unfertilized grass began to decrease. We are now determining the amount and kind of fertilizer that will be needed to sustain high yields and stand persistence.

We have observed big bluestem and switchgrass stands that persisted very well for 9 years at low soil nitrogen and phosphorus (6 to 10 pounds per acre) levels in the State gamelands at Allenwood, Pa., and at Morgantown, W. Va. Most of the topgrowth at these sites was not removed as in the grazing trials so some nutrients undoubtedly were recycled. From these observations, it is fairly clear that the fertility requirements of warm-season grasses used for soil stabilization or for wildlife purposes will be lower than those of grazed warm-season grasses. Pheasants and other game birds frequently used the switchgrass for cover and nesting and deer used big bluestem for cover. However,

Dry matter yields (5 cm stubble) of unfertilized warm-season grasses in late July at the Western Pennsylvania Forage-Beef Farm*

	Year		
	1975	1976	1977
Species	Kilograms per hectare		
Switchgrass			
Blackwell	10,032	9,798	9,565
Ky 1625	6,849	10,291	6,093
Carthage	6,572	11,124	5,421
NY 4006	5,710	7,204	6,966
Bluestem			
NY 1145 (big)	6,618	8,870	5,622
Kaw (big)	4,602	4,623	2,038
Caucasian	5,134	4,097	1,908
Aldous (little)	4,473	2,922	1,277
Indiangrass			
Cheyenne	5,247	3,717	2,043

* For stand persistence, switchgrass, big bluestem, and indiangrass should not be cut or grazed closer than 15 cm. About 30 percent of the yields of these grasses remains in a 15 cm stubble.

we do not know whether the seed or forage of these grasses was consumed by wildlife.

In southwestern Pennsylvania, warm-season grass pastures provided about 150 (86 in July-August) cow grazing days per acre per year for 3 consecutive years, and stands of many warm-season range grasses are still very good. Of interest was our finding that the SCS selection of big bluestem, NY–1145, was much more persistent than 'Kaw' big bluestem under grazing, and produced nearly twice as much forage in late July.

We found that with proper and careful grazing management, cool-season species were compatible with warm-season grasses. The combination provided a longer grazing season beginning in mid-May. Experiments have shown that under better soil fertility, especially at high rates of nitrogen fertilizer, certain harvest practices greatly favored the persistence of cool-season grasses over that of warm-season grasses. Consequently, it is desirable to have warm-season and cool-season grasses in separate pastures. Stubble height left at summer harvests, for example, is far more critical to the survival of warm-season than cool-season grasses. For good stand persistence of big bluestem, switchgrass, or indiangrass, a stubble of at least 15 cm (6 inches) should be left when grazing or harvesting in summer. Stands of these grasses were drastically reduced in SCS trials at Quicksand, Ky., when the grasses were clipped to shorter stubble heights. Thus, only about 65 to 70 percent of the switchgrass, big bluestem, and indiangrass yields (see table) should be utilized in summer to maintain stands of these species.

This point is further illustrated by the wide distribution of broomsedge bluestem in eastern pastures on acid, low fertility soils when grazing pressure is light. This warm-season grass is not prevalent in these same areas when pastures are limed, fertilized, and grazed more intensively.

Grasses of tropical origin, such as the warm-season grasses, have a reputation for producing low-quality forage. Bauke Deinum of the Netherlands claims that warm-season grasses inherently produce lower quality forage than do cool-season grasses, but environmental factors are primarily responsible for the low quality of forage produced in summer. Cool-season grasses also produce lower quality forage under the high temperatures and long photoperiods in summer. For example, quality of tall fescue herbage in summer is reputed to be mediocre to poor, whereas it is very good in autumn. More needs to be known about the nutritive value of warm-season grasses that are produced under different weather conditions, particularly in the Northeast. However, U.S. Department of Agriculture researchers at El Reno, Okla., recently have shown that beef cattle gained up to 1.5 pounds per day on warm-season grasses. Some of our cooperative feeding trials with sheep and cattle will provide new information on differences in the feeding value of different warm-season grasses and the effects that weather conditions have on the nutritive value of these grasses.

In our grazing trials in western Pennsylvania, acceptability of warm-season grass forage by beef cattle generally has been very good, with little bluestem favored most and indiangrass preferred least. Stems of big bluestem were usually preferred over those of switchgrass. This presents a management problem when both species are in the same pasture.

Through cooperative efforts in a new regional research study, we plan to evaluate warm-season grass establishment, production, and persistence on difficult sites, such as wet, droughty, or infertile soils and/or soils with toxicity problems. In addition, feeding trials are planned using warm-season grass hays that will be produced at several SCS plant materials centers and fed to sheep and cattle by Penn State and West Virginia University researchers.

Dr. Jung is research agronomist, Mr. Gross is soil scientist, and Mr. Kocher is research technician at USDA's Regional Pasture Research Laboratory, Science and Education Administration, University Park, Pa.

Mr. Sharp is plant materials specialist, Northeast Technical Service Center, SCS, Broomall, Pa.

Dr. Burdette is professor of animal science extension, Pennsylvania State University, University Park, Pa.

USDA Teamwork in Reclamation

by David G. Unger

Remarks made by Mr. Unger at the "Get Smart on Coal" Symposium, sponsored by the Soil Conservation Society of America and the National Association of Conservation Districts in Washington, D.C., January 30, 1979.

Coal makes electricity to serve communities throughout the Missouri River Basin (above). Reclamation of the mined land (left) is equally important, for food and fiber and environmental protection.

RAMP

Above, leveling and terracing help prepare this North Dakota mine spoil for tree planting.

Great variations in depth and type of overburden mean that reclamation must be site-specific and based on research and experience by USDA, other Federal and State agencies, and private groups.

This forum on surface mining and reclamation teamwork is timely. This week, local offices of the Soil Conservation Service in 29 States will begin taking applications for U.S. Department of Agriculture help in the new voluntary program called "RAMP"—the Rural Abandoned Mine Program. Its success will depend on public understanding, on reclamation standards that will be written in the next few months, and on the resolution of a few technical and economic questions.

I will outline several ways in which USDA will continue to be an active team member in surface mining and reclamation.

First, USDA is active in research about reclamation.

A look at the literature of surface mining and reclamation shows a strong contribution by USDA agencies. In that research we have had six basic aims:

1. To integrate reclamation and land use planning into the plans for active mining.
2. To restore disturbed areas to an optimum level of agricultural productivity or other uses.
3. To stabilize disturbed areas against soil erosion, subsidence, and landslides.
4. To prevent surface and ground water degradation in and adjacent to disturbed land areas.
5. To make use of so-called waste materials in reclaiming disturbed land, so that they become useful resources instead of disposal problems.
6. To improve scenic, wildlife, and esthetic values of disturbed areas.

To help close the technology gaps

Our society through the Congress has asked that something be done to minimize all the costs of mining—including impairment of water quality, ugliness, other environmental degradation, and hazards to life and property.

for programs under the new Federal law, the USDA Science and Education Administration's (SEA) cooperative research group is working with reclamation scientists in State agricultural experiment stations to answer 88 specific research and information needs raised by U.S. Department of the Interior's Office of Surface Mining (OSM).

At our own laboratories in different parts of the country, administered by SEA's agricultural research arm, we have a number of studies underway related to:

- Hydrology and water quality where runoff and ground water patterns have been drastically altered;

- Control of soil erosion so that soil placed on reclaimed sites, at considerable cost, *stays there* to provide a growth medium for plants;

- Soil management practices and the underlying physical and chemical interactions, and improvements in soil testing methods;

- Influence of overburden and topsoil replacement methods on the yield potential, especially important for prime farmlands; and

- Several soil engineering studies to aid in maintaining stable land surface over the long term.

Several USDA agencies also are continuing to work together with the States and with local conservation districts (or their State associations) on new or improved plant materials for mine spoil. Of the 20 plant materials centers that the Soil Conservation Service operates or supports, several devote much of their attention to plants that can do a good job of stabilizing mine spoils or making them productive for grazing animals or wildlife.

USDA's research also extends to economic questions. Our Economics, Statistics, and Cooperatives Service (ESCS) looks at surface mining and reclamation from the perspectives of energy production and use, food and fiber production, natural resources, and water quality. In a study completed last year, ESCS investigated the economics of land reclamation in the West, in cooperation with the U.S. Environmental Protection Agency (EPA).

The study showed that reclamation costs ranged as high as $9,000 an acre in some places but averaged about $3,500. Differences were primarily the amount of earthmoving that needed to be done, or how deep the coal was buried. Other variations were due to thickness of the coal seam, which would influence the reclamation cost per ton of coal produced. Still other variations were caused by climatic conditions in the areas to be reclaimed.

Studies like this one are aimed at helping answer questions about the economic value of reclamation. The answers are not easy ones. One view is that reclamation costs per acre far exceed any prospective per-acre returns from farming, ranching, or forestry over any reasonable time period. Yet another view is that offsite as well as onsite economic benefits from reclamation should be counted, and a longer time-horizon should be used in comparing costs and benefits.

In actuality, the standard "benefit-cost ratio" may not really fit the reclamation of surface-mined land. Our society through the Congress has asked that something be done to minimize all the costs of mining—including impairment of water quality, ugliness, other environmental degradation, and hazards to life and property.

Reclamation may well cost more than any hoped-for returns from each specific site, although USDA will try to help minimize reclamation costs. At the same time, there are other benefits for the landowner and for society that we do not measure in solely economic terms.

Second, USDA is active in the transfer of research information to people who can use it.

The major aim of SEA's Extension staff and the Cooperative Extension Service system that touches almost every county in the United States is to help land users and local governments make better decisions by interpreting and translating the results of USDA research and making them available.

The major aim of SCS is to use research results in adapting soil and water conservation practices or systems to fit specific needs or sites, and to provide for land users information about those practices or systems as well as information about soils, land uses and trends, useful plant materials, and other natural resource data.

Some examples of Extension efforts in mined-land reclamation include 3 years' worth of training sessions, test demonstrations, and tours for surface mine operators, mine inspectors, and others in Virginia. They were aided by SCS, the Virginia Division of Forestry, and the Virginia Division of Mineland Reclamation as well as by local 4–H Clubs. Virginia's Extension staff also

SCS technical assistance will reach a new peak under RAMP. There are more than a million acres of abandoned coal surface mines that need reclamation. We won't fix all of them under RAMP, but we hope to work on a majority of the really troublesome sites.

helped update the State's reclamation guidelines.

Extension, SCS, OSM, and State agencies worked together on a 1-day educational program in Pennsylvania that was attended by 170 miners, contractors, and landowners. They talked about new Federal and State programs, and discussed and demonstrated several kinds of methods and equipment.

West Virginia's Extension staff sponsored a statewide symposium last year that included mine-land reclamation, and they plan to hold a similar session this fall.

SCS also has a tremendous role in "technology transfer" about mined-land reclamation because it has offices in nearly every county; frequent contacts with individuals or firms that own, manage, disturb, or improve land; and a number of surveys and inventories that provide useful information.

The soil survey is a basic tool in many kinds of land-use and conservation decisions. Its use is not required in mined-land reclamation, except in the case of restoring prime farmland. Yet the regulations do call for many of the kinds of information that are in a soil survey, and the demand for soils information has increased even where its use is not mandated. We are doing all we can to accelerate soil surveys and to sharpen their usefulness in mined-land reclamation decisions.

Third, USDA is active in mined-land reclamation.

USDA's Forest Service (FS) manages 187 million acres of American land. Thousands of acres that FS acquired in its first years as an agency were abandoned mined lands that were severely eroded and degraded. FS began improving those lands, and started research on reforestation of spoil banks in several States. In the 1960's, that research was expanded to include soil and road stability as well as hydrology.

As the years went by, other lands intertwined with FS lands were mined or reclaimed (or both). In 1972, FS set up a "Surface Environment and Mining Program," or "SEAM," headquartered at Billings, Mont. It has researched, developed, and applied technology to maintain surface values and a quality environment while meeting the Nation's mineral requirements. It has been particularly helpful in addressing rehabilitation potential and techniques for western sites.

FS aids the reclamation of privately owned mined lands through its longstanding close relationship with State forestry agencies. These agencies and their cooperative forestry programs contribute to successful reclamation by providing seedlings, improving planting stock, and providing technical help in using wood residues to improve the surface soil.

Technical assistance is the long suit of SCS. The agency has helped local conservation districts and their cooperating landowners reclaim thousands of acres of mined lands. In many cases, SCS has provided the technical backup for mining firms until they arranged for their own reclamation staff.

SCS technical assistance will reach a new peak under the Rural Abandoned Mine Program. There are more than a million acres of abandoned coal surface mines that need reclamation. We won't fix all of them under RAMP—not by a long shot. But remembering that a major objective of the program is water

USDA scientists have found that grasses grow much faster on sodic mine spoil when topsoil is mixed with gypsum.

Soil tensiometers help track the movement of salt into and through soil placed on top of sodic mine spoil.

quality, we hope to work on a majority of the really troublesome sites.

As I mentioned earlier, the first signup period under this voluntary program begins this week. We will work first on those sites where there is extreme danger to people or property. We will also be able to address some of the "priority 2" lands, where there are significant adverse effects from past mining. We will accept applications for "priority 3" mines where reclamation will help restore the environment, esthetics, and usefulness of the land—but we probably won't be able to provide funding or technical help on these sites for several years.

We are excited about the opportunity this program has for improving water quality *and* agriculture.

Fourth, USDA is active in helping set policies and standards related to mined-land reclamation.

SCS and FS have detailed 25 people to OSM over the past 2 years to aid in drafting and compiling and responding. SEA has contributed several people, too. We will have some people on the coordinating committee to write standards for the abandoned lands over the next few months.

We have worked with EPA, the Council on Environmental Quality, and conservation districts on water quality aspects of surface mining and reclamation.

We have worked with these same groups and with mine owners on questions related to the mining of prime farmlands. In the East, where much of the mining has been done, there isn't much land that qualifies as prime for farming. In the Midwest, some of the scars of past mining are on prime farmland as well as some of the acres where mining is proposed. Out West, where most of the mining is yet to be done, some is on prime farmland.

USDA is pleased with the Federal law's protection of the prime farmland base, in order to achieve coal *and* food and fiber. There still is some research needed on techniques, methods, and impacts. Yet America is losing so much prime farmland to other purposes—as much as a million acres a year—that USDA is pleased to see that some of the prime farmland base has some special attention.

In policy-setting and policy-aiding, USDA is guided by the activities of a special committee called "RECLAM"—for "Reclamation of Lands Affected by Mining." The committee—made up of people from six USDA agencies plus the Secretary's office—coordinates our reclamation activities in research, development, and application; education; onsite technical assistance; inventory and monitoring; financial aid; and reclamation of public lands. It also helps coordinate with OSM, EPA, and others.

In aiding policy related to prime farmland, USDA also is guided by a Land-Use Committee which is active at our Washington headquarters and in every State. We are not setting land use ourselves, except for National Forests and Grasslands—rather we are trying to help local communities and State governments put together the information to guide their land-use choices as well as those of private landowners.

Finally, USDA is active in aiding State and local reclamation decisions.

In the language of the new generation, the State level is "where the action is. . . where it's at." More than 20 States are going to introduce legislation in the next year or so to implement the Federal surface-mining and reclamation law. Now is the time for USDA staffs—and for all the rest of the groups represented in this auditorium—to help those State groups and agencies put the legislative packages together.

Local people as well as Federal agencies and national and international organizations need to keep track of what the States are considering.

We need not only to keep track of each other but to carry out to the fullest the theme of this symposium—surface mining and reclamation teamwork.

I'm pleased with the sharing of ideas and person-hours we all have demonstrated thus far—and I look forward to even better cooperation over the next few months and years.

The energy, the land, and the environment are worth the extra attention.

Mr. Unger is deputy assistant secretary for Conservation, Research, and Education, USDA, Washington, D.C.

Something to Brag About

With RC&D help, two community projects result in safe drinking water and a renewed economic future.

by William W. McCartney

"People just can't quit bragging about the water we have in Browning," said Eddie Winston, Browning's water superintendent. Not long ago, this small Schuyler County, Ill., community of 450 people was faced with the problem of an inadequate and polluted water supply.

Everyone had wells, but nearby septic tank filter drainage fields were polluting the water systems. Water samples taken from the wells could not pass the test for safe drinking water.

Today, however, Browning citizens have an abundance of clean, pure water, thanks to Eddie Winston and Sidney DeWitt, chairperson of the Browning Village Board. Winston and DeWitt asked for assistance from Two Rivers Resource Conservation and Development (RC&D) Area in solving resource development needs for their village. The most important need was an adequate supply of safe drinking water.

Browning, on the Illinois River, is in an excellent location to get water from an underground source. Twelve years ago, the leaders of Browning hired an engineer who developed a plan for a new water supply system. But they were not able to finance installation of the system at that time.

In 1974, the Two Rivers Regional Council of public officials was organized through the assistance of the Two Rivers RC&D and the Schuyler County Board. In 1975, staff members of the council helped the Browning Village Board secure a grant for $184,000 from the U.S. Department of Housing and Urban Development. The grant covered the cost of materials and construction for drilling a well, installing waterlines, and building a pump and pumphouse. Today, the Browning Village Board uses the pumphouse for its meetings. For the citizens of Browning, a clean, pure water supply is a dream come true.

The Browning Village Board and Chairperson DeWitt also dreamed of developing a modern boat launch ramp near their town on the Illinois River. For commercial fishers and boaters who had been using an old gravel approach to launch their boats, launching was often difficult or impossible because of frequent flooding and muddy ground.

In 1973, the Illinois Department of Conservation had planned a modern boat launch ramp about 1 mile upstream from the village of Browning, but the Browning Village Board and RC&D council suggested changing its location to Browning.

The Browning site for the boat launch ramp was close to the highway and had better access to the river than the department's proposed ramp site. Furthermore, if the ramp were located near the village, the merchants would have a better opportunity to sell their supplies.

Browning offers one of the few boat launching sites on the west side of the Illinois River for access to water-based recreation and fishing. Commercial fishing is one of the main industries and locating the ramp at Browning, according to the Browning Village Board, would have a positive effect on the operation and efficiency of the industry. The board pointed out to the Illinois Department of Conservation that the Browning site would also offer a chance for more and better security and lower operation and maintenance costs.

After consulting with the village board and the RC&D council, the Illinois Department of Conservation agreed to locate the new boat ramp at Browning. The department awarded a $125,000 grant to the Schuyler County Board for the design and construction of the ramp. However, this was based on the condition that the county board would agree to maintain and operate the boat launching ramp area. The county board agreed and in the summer of 1976, a new boat launching ramp at Browning was completed.

Through the cooperative efforts of the Schuyler County Board, the Two Rivers RC&D Area, the Two Rivers Regional Council of public officials, and the Illinois Department of Conservation, State and Federal grants were obtained to provide needed community facilities. Now the village of Browning has a renewed economic future, for the Browning Village Board's dreams have come true.

Mr. McCartney is RC&D coordinator, SCS, Pittsfield, Ill.

Current Directions in Conservation Research

Using [illegible] electrode [illegible] able to make quick [illegible] ments in the [illegible] Robert J. Prather [illegible] used to measure the [illegible] between the [illegible] The device is an [illegible] technique that [illegible] by geophysicists [illegible] depth to sub-surface [illegible] ore bodies [illegible] the technique [illegible] average salinity in a relatively large volume of soil.

Researchers are working on low-pressure distribution systems to reduce the amount of energy required to pump water.

Better ways to conserve irrigation water, monitor salinity, and predict and control soil erosion have been reported by Agricultural Research, part of USDA's Science and Education Administration (SEA).

In its latest progress report on soil and water research, the agency also called for a return to crop rotation. In addition, SEA told of new studies on water stress in plants and refinements in the Universal Soil Loss Equation.

Monitoring Salinity

SEA researchers have developed a four-probe salinity sensor that permits measuring, mapping, and monitoring of field salinity and detection of saline seeps.

The new tool should prove of value in the Colorado River Basin and other locations where the subsoil contains salt deposits. In these areas if more irrigation water is added than is needed to supply crop needs and to leach the salt just below the root zone, some of the salt is dissolved and is returned to the river in the drainage water.

Seeking to combat this saline pollution, researchers found that corn yields can be maintained with less irrigation water than is generally used. If the new and recommended management system is adopted throughout the valley, researchers expect to cut in half the amount of salt added to the Colorado River each year in drainage water.

Scientists also learned that legumes, oilseed crops, and small grains seeded on recharge areas that contribute water to saline seeps can intercept the water that would otherwise leach salt out of the subsoil. This would diminish the seep areas and enhance reclamation.

Conserving Water

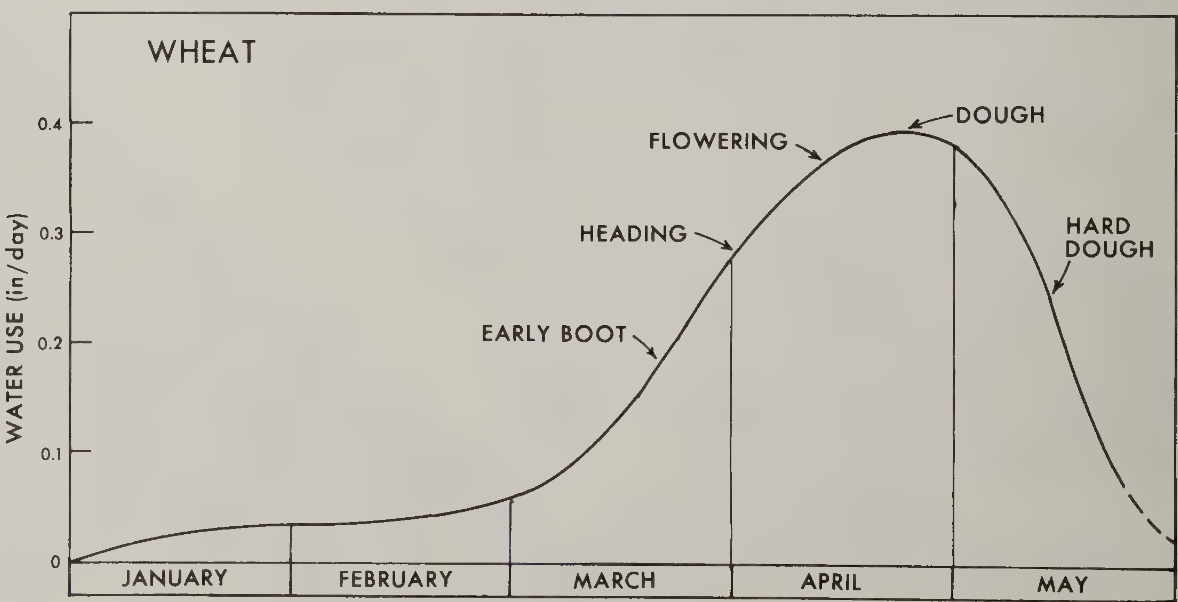
SEA researchers have developed guidelines that permit farmers to schedule irrigation for specific crops, soils, and water supplies. In 1977, a cooperating farmer who produced 200 bushels of corn per acre on irrigated land was able to use only 75 percent as much water as he would otherwise have used by following an irrigation schedule.

In another project, irrigation motors were cut off during the day when urban demand for energy was high. The farmers saved $143,000 in demand costs on 35 electric motors. Researchers also are working on low-pressure distribution systems to reduce the amount of energy required to pump water.

Tolerating Water Stress

Availability of soil moisture is often the most limiting factor in plant growth. Because of this, researchers are working on better procedures for increasing the tolerance of plants to water stress. If water needs, temperature requirement patterns of plants, and the rainfall and

Fluctuations in Water Use of Wheat During Growth Cycle



More soil moisture is needed during peak periods of the growth cycle to avoid water stress. These peak periods result when climatic conditions favor rapid plant growth and seed production.

temperature patterns of an area are known, researchers can then predict the times that water stress to the plants will occur and the intensity and consequences of the stress. Scientists are working with the National Aeronautics and Space Administration and the National Oceanic and Atmospheric Administration in obtaining data from remote sensing devices to monitor stress.

Conserving Soil Fertility

When the United States was settled by Europeans, there was 5 to 10 percent organic matter in the soils. Decomposition of that organic matter released enough plant nutrients to sustain crop production for a number of years. Today, however, half the organic matter is gone and farmers must supplement the native nutrients with fertilizer. Animal wastes are being used, but there are not nearly enough to meet total fertilizer needs.

SEA scientists believe it is time to return to legumes—especially in forage production—and to reevaluate fertilizer management requirements for long-term production to avoid damage to the environment. They have found that, particularly in humid regions, it is important to maintain a plant on the soil which takes up nutrients as they are released from decomposing organic matter. Otherwise, these nutrients will be leached from the root zone.

Controlling Erosion

Researchers are continuing to work out new methods for predicting and controlling erosion from wind and water and sediment deposition. They also are making refinements and adjustments in the Universal Soil Loss Equation where dissolved pollutants are in runoff.

Land management practices are being developed to control the rate of water yield from watersheds. Preliminary studies show that the rate of water yield can be greatly reduced without reducing the total yield. Slowing the rate markedly reduces the pollution from watersheds.

Far left, a USDA scientist examines a crop irrigated through an automated gated pipe control system.
Near left, irrigation sequences can be programmed on an electronic controller. This unit can "tell" a series of 12 battery-powered pilot valves when to open and close.

The Water That Came to School

by Dave Anderson

Kids no longer have to wade through floodwater to go to school in Marcola, Oreg., because there is a new flood prevention project in town.

The Marcola Elementary School has had flooding problems since it was built in 1925. It has been closed on several occasions when runoff from the hill above the school could not be handled by the undersized channel and water would spill onto the schoolgrounds. Excess winter water also flooded homes and businesses in this rural community of 650.

After having to contend with the inconvenience of high water for many years, the people of Marcola asked the Upper Willamette Soil and Water Conservation District to help them develop a plan to alleviate their flooding. Using grant funds from the Upper Willamette Resource Conservation and Development Area and with assistance from the Soil Conservation Service, a flood prevention project was designed and completed in the summer of 1977.

The townspeople of Marcola, Oreg., had a 27-inch pipeline installed to divert floodwater away from the elementary school.

Two pipelines were installed to carry the runoff water under two streets to the Mohawk River. In addition, an 800-foot open channel and another buried pipeline were needed to collect and divert water away from the Marcola School.

Cooperation from local people and agencies was excellent. A local company's railroad, which normally transports two trainloads of logs daily, was closed to permit construction of one pipeline. During construction, streets were disrupted and lawns needed reshaping and seeding, but none of the residents complained. Lane County agreed to grade and resurface the streets. Total cost for the project was $108,000 of which $3,000 was local money.

The flood protection system was tested during the 1977–78 winter when a high-intensity rainstorm produced more than enough runoff to create severe flooding.

The school was closed again, but this time due to a power failure, not because of high water. The system worked and Marcola citizens were pleased.

Mr. Anderson is RC&D coordinator, SCS, Eugene, Oreg.

Meeting a Special Need

by F. Dwain Phillips

Development of recreational facilities around a lake near Boswell, Okla., has met a special need in that small rural community. All the facilities have been designed and built to accommodate the needs of the elderly and the handicapped.

More than 1 mile of asphalt trails have been built on the contour of the land to allow those in wheelchairs to use them. A special fishing dock has been constructed with rails for safety. Picnic tables have been built from 5-inch-thick oak lumber and extended on one end to allow for wheelchair usage. The thick wood was used for its durability as well as for adding to the natural setting of the park.

Charcoal grills, restrooms, a pavilion, drinking fountains, trash receptacles, and three wooden foot bridges across the upper end of the lake have also been constructed. Two thousand feet of graveled trails have been constructed through a natural area where over 750 trees and shrubs were planted for added beauty. More than 14,000 square yards of vegetation was also established in the park.

The park is a project of the Ouachita Mountains Resource Conservation and Development (RC&D) Area. Sponsors of the measure were the Kiamichi Conservation District, the Ouachita Mountains RC&D Council, the Oklahoma Department of Tourism and Recreation, and the Soil Conservation Service. Funds for the project were furnished through the RC&D program by SCS and the Oklahoma Department of Tourism and Recreation, each agency furnishing 50 percent cost-share funds. The Heritage Conservation and Recreation Service, U.S. Department of the Interior, provided cost sharing for the restrooms, pavilion, and flag poles before the project became an RC&D measure.

SCS engineers, a biologist, forester, and landscape designer provided technical assistance in the design and construction of the facilities. Leroy Brown, SCS district conservationist at Hugo, was the overseer of the project and he worked closely with the Oklahoma Department of Tourism and Recreation employees in developing the area.

According to Brown, the community has a large number of retired people who didn't have recreational facilities close enough to use. The park, developed around a small existing lake only 1 mile from town, now gives them a place to go.

"Although all facilities have been designed for easy use by the elderly and handicapped, this certainly doesn't restrict the park's use by others," Brown noted.

The project had great support from the community because as one local resident said, "Small rural communities usually don't have nice parks like this one."

Mr. Phillips is public information officer, SCS, Stillwater, Okla.

SCS District Conservationist Leroy Brown examines one of the many plants which added to the beauty of Boswell Park.

A Touch of Georgia in Rhode Island

by Gordon L. Leckie

Can smalltown folks have as much fun as their city cousins? Georgia Ure of Hopkinton, R.I., says "Yes, maybe more."

As director of recreation for this small town in southwestern Rhode Island, Ure combines her training in recreation with conservation. Her formula works. Since Ure took the reins 3 years ago, she has created a model recreation program for the 6,000 townspeople. Now they are the envy of much larger towns.

According to Ure, the program actually began 6 years ago when she wrote her thesis at the University of Rhode Island, for which she developed a recreation plan for her hometown of Hopkinton.

But friends living in all parts of the 60 square miles of Hopkinton are convinced she has a magic touch.

Roger Levesque, who helped Ure coordinate a number of Federal programs, agrees that it appears to be magic. Levesque, who also spearheaded a number of Hopkinton developments, headed the Rhode Island Resource Conservation and Development (RC&D) Area, a Federal program coordinated by the Soil Conservation Service.

According to Levesque, "About 4 or 5 years ago, people in Hopkinton had only one park and no other facilities. Today, the town has six areas and townspeople of all ages can enjoy year-round recreation programs."

"I have no special magic. We're just better off than most big towns for one very special reason," Ure explained. "People in small towns like Hopkinton are generous. They are eager to donate their time, money, and possessions. We help each other. All we did was combine 'neighboring' with government programs. Now we have the best of two worlds."

There's no wonder Ure emits an aura of magical powers. The National Recreation and Park Association recommends towns reserve 10 acres for recreation in every 1,000 acres of land. Hopkinton jumped from a 7-acre picnic area with few facilities to 80 acres of well-equipped parks within 2 years. By 1980, Ure expects the town to have 100 acres of parks, which will meet the national standards.

The town's first project was Ashaway Park. Ure says it is typical of the town's spirit. A property owner donated to the town about 5 acres that adjoined the Ashaway School. The area is now an outdoor classroom and recreation area. RC&D matching funds helped the town apply needed erosion control programs.

There are no seasonal shutdowns and no generation gaps at Ashaway. In the summer, all ages enjoy hiking along nature trails around the long, twisting pond. During school months, classes use the park as a nature study center.

In the cold of winter, young people dominate the ice skating crowd. The town checks the safety of ice each day. When it's safe to skate, the youngsters watch for a town official to run up a green flag on a nearby hill. When ice isn't safe, they see a red flag.

Levesque said another RC&D measure obtained funds from the U.S. Department of the Interior's Heritage Conservation and Recreation Service (HCRS) and six other sources. This helped transform a nightmarish gravel pit into a dreamlike neighborhood park adjacent to Hope Valley School.

SCS drew up the specifications to grade, slope, and seed the pit. The project not only provided the needed play area for the school, but it also eliminated an erosion and sediment problem that disturbed the neighbors.

Ure says no RC&D funds were used for another project located at the Ashville pond. "But," she says, "SCS was a great help when they made a plan for the pond. This pond was our first public water recreation. That was ironic. We have a great deal of water along our town boundaries, but no swimming areas."

She considers Ashville a good "Yankee" project. "For $10, we obtained a 10-year lease from the State to use the pond as the town swimming area. Then, we moved sand from the Hope Valley gravel pit to make a beach at Ashville. Farmers donated machinery to dredge the pond and grade the beach. The telephone company gave us broken poles to make the needed fences.

"Ashville has a shelter with telephone service and first aid equipment. We have a 20-car parking lot, emergency road, picnic area with hibachis, and rest room facilities. We did all that for $6,000."

The ambitious, fast-moving recreation program must have impressed the owner of Ashaway Line and Twine, a famous maker of tennis strings and fishing lines. Julian T. Crandall offered his 60-acre estate, at a bargain price, and the town was able to buy it for $24,650, with cost-share help from HCRS.

The Crandall Estate includes a 12-room house, barn, outbuildings, and a lighted tennis court. Plans call for the house to be used as a recreation center for all townspeople. Senior citizens, church members, cribbage fans, Scouts, and all age groups will enjoy the Crandall home as a gathering place.

"The Crandall property was a blessing," Ure explains. "Beginning with the 1977-78 school year, our school held double sessions. The Crandall Estate will supplement education programs to occupy the young peoples' leisure time."

She says numerous individuals and groups helped Hopkinton tie the recreation system together. "SCS made the site plans and gave us technical assistance in overseeing construction. RC&D steered us to the various funds. Recreation Commission members—Lillian Poston, Beverly Goff, Ronnie Vaughn, and Al Sicliano—set policy. They are the doers.

"We are doing a lot in a hurry," she adds. "We had to act when opportunities knocked—especially when land was made available to us. You might say the Crandall Estate represents the town's character. Hopkinton maintains a rural atmosphere very much the way it was in the 1600's."

Today, the Crandall Estate, along with the other areas, belongs to everyone in town. One resident was overheard to say, "I use the Crandall property every time I drive to town."

Townspeople did not let Ure's work go unnoticed. In 1976, the Southern Rhode Island Conservation District honored her as the Conservationist of the Year.

Ure says, "It was my lucky day when I first heard of SCS programs."

But most folks around Hopkinton know that it was their lucky day when Georgia Ure came home.

Mr. Leckie is a public information specialist, Northeast Technical Service Center, SCS, Broomall, Pa.

Meetings:

May	
1-3	International Association for Great Lakes Research Conference, Rochester, N.Y.
6-11	National Council of State Garden Clubs, Inc., New Orleans, La.
23-25	Southern Forestry Conference, Memphis, Tenn.
28-June 1	American Geophysical Union, Washington, D.C.
June	
3-7	American Institute of Architects, Kansas City, Mo.
4-8	General Federation of Women's Clubs, New Orleans, La.
5-7	The Garden Club of America, Milwaukee, Wis.
11-13	American Plywood Association, Portland, Oreg.
17-21	Outdoor Writers Association of America, Albuquerque, N. Mex.
24-27	American Society of Agricultural Engineers, Winnipeg, Manitoba, Canada
24-28	American Seed Trade Association, Inc., Washington, D.C.
24-29	Air Pollution Control Association, Cincinnati, Ohio
24-29	American Water Works Association Conference, San Francisco, Calif.
29-July 1	National Audubon Society Convention, Estes Park, Colo.
29-July 2	American Association of School Administrators, Denver, Colo.
July	
10	No-Tillage Systems Conference, Lexington, Ky.
14-18	National Association of Counties, Kansas City, Mo.
19-21	Izaak Walton League of America, Inc., Anaheim, Calif.
22-26	National Federation of Business and Professional Women's Clubs, Inc., Boston, Mass.
28-Aug. 1	American Association of Nurserymen and Southern Nurserymen's Association Convention and Trade Show, Atlanta, Ga.
29-Aug. 1	American Agriculture Economics Association, Pullman, Wash.
29-Aug. 1	Land Application of Waste Materials Conference, Ottawa, Ontario, Canada
29-Aug. 1	Soil Conservation Society of America, Ottawa, Ontario, Canada

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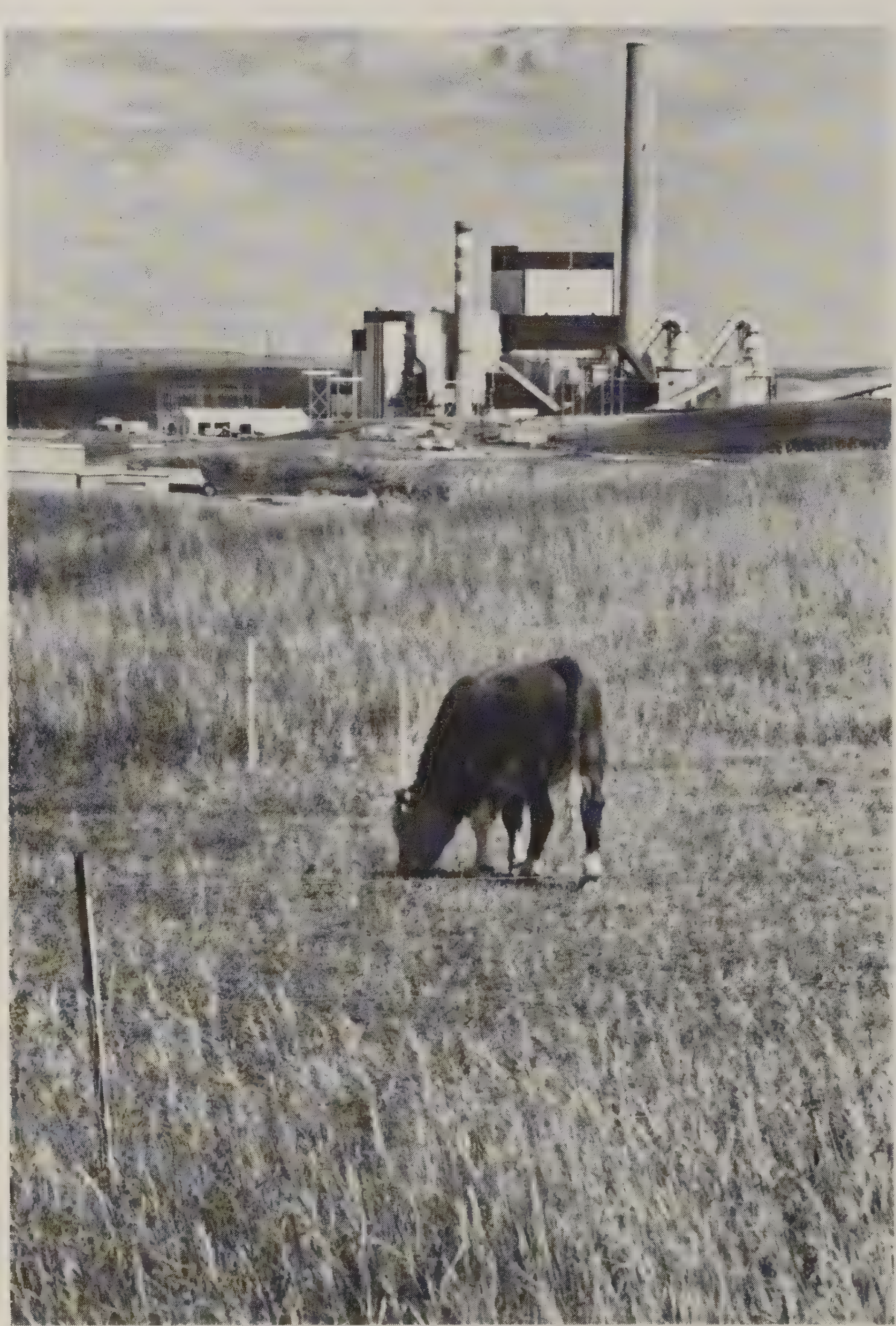

Soil Conservation

June 1979

U.S. Department of Agriculture

A Fresh Opportunity; A Fresh Challenge

From the Administrator

A new strategy for USDA conservation programs is now being built from:

- The most public suggestions we have ever received;
- The most natural resource data we have ever reviewed; and
- The most thorough process for linking program direction to appraisal findings ever undertaken.

In August, the "first draft" of a Resources Conservation Act (RCA) program—and the appraisal on which it is based—will go out for extensive public review. It will be a fresh opportunity for conservation districts and others to shape the conservation programs, policies, and priorities of USDA agencies. It will be a fresh challenge for districts and for USDA employees to encourage citizens and organizations to again make their views known.

Public participation last year was excellent; more than 160,000 Americans expressed their concerns by letter, by formal comment, or in person at over 8,700 RCA meetings.

It has been quite a job to compare what each citizen said with others' comments, with detailed analyses of many sets of physical data, with likely benefits and costs, and with political realities. The ideas turned out to be good ones—and the concerns are very real.

From them can emerge a comprehensive set of both new and old approaches and programs, as well as a new vote of confidence in many of the present efforts.

The RCA draft program and appraisal will need just as thorough a look as the first questions had last summer. A number of different means for public input will be provided, to be sure that as many voices as possible help chart the future.

An important result of RCA will be the development and strengthening of local and State soil and water conservation programs. More than $6 million in RCA funds has been granted the past 2 fiscal years for that and other purposes—and State soil and water agencies and individual districts are putting the money to effective use. They are being aided by sample outlines for long-range programs that a special task force of the National Association of Conservation Districts (NACD) prepared.

What is the final test for efforts at all levels? As one sample NACD outline says, "The effectiveness of a conservation program must be measured by its ability to encourage private landowners to take needed conservation action."

With the leadership and support of so many full partners in the RCA process, I am convinced we will pass that test.

Mel Davis

June 1979, Vol. 44, No. 11

Soil Conservation

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Front cover:
Quail and other wildlife are depending more and more on landowners' developing habitat. Many conservation plants, such as shrub lespedezas, can be established to furnish food and cover for wildlife. (See article beginning on page 4.)

Back cover:
Research Roundup (see pages 18 and 19) includes an item on predicting wind erosion protection of range grasses.

by Cluster R. Belcher
and W. Curtis Sharp

Tasty Lespedezas

Wildlife, especially quail, find food and cover in some shrub lespedezas, which also protect eroding areas.

Lespedeza bicolor is the most common shrub lespedeza. Since ordinary bicolor won't grow in all quail country and has other limiting factors, newer strains of lespedeza, such as 'Natob' and 'VA–70', have been developed.

Farm game, such as the bobwhite quail, depends more and more each year upon landowners' developing habitat rather than relying on nature to supply its needs.

The farm economic squeeze has forced landowners to intensify their farming operation. This has led to the elimination of many natural hedgerows, weedy fence rows, and other areas which provide good game habitat. The farmer interested in game now looks more to odd areas—such as fence corners and bare strips between fields and woodland—on which to develop wildlife habitat.

Some species of shrub lespedezas make good-quality food and furnish cover for quail. These legumes, which supply their own nitrogen after the first year, can also provide cover for eroding areas.

Biologists have found that quail like the seeds of shrub lespedezas and that, fortunately, sparrows, blackbirds, doves, rats, and mice, which destroy many grains and other bird foods, do not like them.

The most common of the shrub lespedezas is *Lespedeza bicolor.* But since ordinary bicolor won't grow in all quail country, biologists and plant specialists have developed a more hardy strain called 'Natob'. It can be grown farther north because its seeds ripen earlier than other shrub lespedezas and its stems are more winter hardy. Natob is recommended where the growing season is 145 days or longer and the first frost is September 25 or later. Its seed yield is about 350 pounds per acre in most parts of this recommended area.

A strain of another shrub lespedeza, *Lespedeza thunbergii,* has been selected which produces mature seed in areas with 165 frostfree days and the first killing frost is September 25 or later. It is called 'VA-70', has good vigor, and equals or exceeds Natob lespedeza in seed yield.

Hunters like VA-70 because the leaves fall from the plant by the beginning of the hunting season. The plants then form a screen, not a blind.

Although leaf drop occurs near the time of the first killing frost, its effectiveness as a conservation plant is not lost. The fallen leaves form a mulch that usually remains on the ground throughout the winter. The mature seeds fall into this mulch and lie there until they are eaten or are no longer useful for wildlife food.

VA-70 was selected in the early 1950's by Karl Graetz at the former Soil Conservation Service Sandy Level Nursery in Gretna, Va. It produced the most seed of any strain tested, up to 500 pounds per acre, and was the earliest flowering.

VA-70 lespedeza attains a height of 6 to 7 feet. The foliage is attractive during the vegetative stage and the purplish-pink blossoms add color during the late summer. It is best adapted to an area extending from Massachusetts through southern Pennsylvania and central Ohio, Indiana, and Illinois to the Kansas/Missouri border. The southern limit is northern Georgia, Alabama, and Mississippi.

Stands are easily established by drilling the seed into firm, well-prepared seedbeds. VA-70 will tolerate slightly acid, droughty sandy soils and grows well on clay loam soils with medium fertility. The shiny black seeds mature by October in New Jersey but earlier farther south.

The seed shatters shortly after maturing. The seeds are hard and slow to deteriorate even when in contact with moist soil. Seeds have been observed on the ground during the early spring. This makes VA-70 useful for ground feeding wildlife, especially in early spring when food is in short supply. The stems provide food for browsing animals such as deer.

Another strain of *Lespedeza thunbergii,* widely tested in the south, will be released within a year by the SCS plant materials center in Americus, Ga. The proposed name is 'Amquail'. It is for use in areas south of the normal range of VA-70. It is more woody, taller growing, and later maturing than VA-70. It is resistant to deer browse and root damage by pocket gophers, factors limiting the use of bicolor lespedeza in the South.

Mr. Belcher is manager, Cape May Plant Materials Center, SCS, Cape May Court House, N.J.

Mr. Sharp is plant materials specialist, Northeast Technical Service Center, SCS, Broomall, Pa.

'Sunglow' for Erosion Control

by Barbara L. Maus

'Sunglow' grayhead prairieconeflower (Ratibida pinnata) has been recently released as a cooperative research effort by the Soil Conservation Service; the Nebraska Agricultural Experiment Station, University of Nebraska, Lincoln, Nebr.; the Kansas Agricultural Experiment Station, Manhattan, Kans.; and the Nebraska Department of Roads.

The wildflower is adapted especially for the Midwest and grows best in Nebraska, Kansas, Oklahoma, Iowa, and Missouri and portions of South Dakota, Arkansas, and Minnesota.

Sunglow provides natural erosion control with a good root structure which holds the soil in place. When planted along with other varieties of wildflowers and grasses, it has great potential for stabilizing roadside rights-of-way, rest areas, parks, gardens, and recreation areas and for reestablishing prairie or natural areas.

Sunglow can be found growing on dry prairies and in open woods with tall and medium-height grasses such as big bluestem, indiangrass, switchgrass, and sideoats grama.

The plant grows from 20 to 60 inches tall with light-yellow blossoms that droop down around the top of a long, slender stalk. In the center of the flower, a spherical, slightly elongated disk looks toward the sun. The disk is grayish at blooming time and gradually turns to dark brown. The blooming season begins in the middle of June and continues until late August.

The perennial's stout, fibrous, deep roots do a good job of keeping soil in place while the flowers provide color and beauty to the landscape.

Ms. Maus is public information specialist, Midwest Technical Service Center, SCS, Lincoln, Nebr.

'Sunglow' grayhead prairieconeflower passed the test as a conservation plant at the SCS plant materials center in Manhattan, Kans.

The Plant That Came Out of the Cold

by George A. Brodie

Lupine, once a leading conservation cover crop in the Southeastern Coastal Plain, may be on the way back.

'Frost' lupine (Lupinus angustifolius), an improved variety of blue lupine, is more cold resistant than its predecessors which accounts for its growing popularity. It also has little bitterness and is believed to be more disease resistant than other lupine varieties.

The first plantings in Allendale and Barnwell Counties in South Carolina were made 6 years ago. There are now about 5,000 acres planted to Frost lupine in the two counties. Trial plantings were also made in several surrounding counties in the fall of 1977 and the results were generally good.

According to J. W. Rosier, a Barnwell County farmer, "The best planting time is in late September or early October." He pointed out that with mild winter temperatures the plants will reach maturity at 3 to 4 feet in time to plant soybeans.

"It's best to plant Frost lupine on your soybean land so that you can turn the crop under during full bloom if possible about 3 weeks before planting time," said Rosier.

"I've had some loss of plants due to cold weather and brown spot fungus," he continued. "But I'm not discouraged because temperatures during the winter of 1977–78 were as low as 14° F."

Rosier plants his lupine in 100-foot strips for wind erosion control as well as for a green manure crop. He uses 40 pounds of inoculated seed per acre.

It is recommended that soils be limed to a pH of 6.0 to 6.5 and phosphorus and potash should be in the high range.

Frost lupine, like its predecessors, is a heavy nitrogen-fixing plant. It is not uncommon for a good crop to fix 100 pounds or more of nitrogen per acre. It will also produce 2 to 3 tons of dry forage.

Field trials have shown that there is a tendency for nematode buildup and treatment should be considered if soybeans are to follow lupine. Its low alkaloid content makes it palatable to deer. Scattered trial plantings in heavily populated deer areas of the State have suffered severe damage from overbrowse.

Frost lupine was developed by the Georgia Agricultural Experiment Station, Tifton, Ga., and the Florida Agricultural Experiment Station, Gainesville, Fla., and was released in 1969.

Mr. Brodie is district conservationist, SCS, Barnwell, S.C.

Farmer Pete Rosier followed this planting of 'Frost' lupine with soybeans. The lupine serves to control wind erosion and as a green manure crop.

'Bobwhite' Is for the Birds

A wildlife soybean provides a feast for birds, large and small.

by Jimmy Henry and Richard R. Brown

At right, a handful of 'Bobwhite' soybeans shows the variation in size and color. The size variation makes it edible by large and small birds. Below right, if tall weeds are available, Bobwhite will climb them making seed harvest easier.

Wildlife can now be served a banquet rather than getting leftovers.

After several years of selection, 'Bobwhite' soybean (Glycine sp.) was released to commercial producers through the Missouri Seed Improvement Association. This release was the result of cooperative efforts by the Missouri Department of Conservation, the University of Missouri, and the Soil Conservation Service.

Bobwhite soybean produces seeds from 1/8 to 3/16 inch in diameter ranging in color from yellow to black. The variation in seed size makes it edible by both large and small birds, such as quail, turkey, pheasant, prairie chicken, and a host of songbirds.

It takes about 120 days for all the seed to mature, but seed maturation varies 3 to 4 weeks from the first mature seed to the last. This variability in seed maturity allows a wide geographic range of adaptability. The early maturing seed pods usually shatter readily; however, some pods retain seed well into winter. Thus wildlife is provided with a high-energy food for a long period of time.

Bobwhite soybean seed has been furnished to landowners in Iowa, Illinois, and Missouri for trial plantings to determine its area of adaptation. Well-established stands have perpetuated themselves for 3 to 5 years in northern Illinois and northwest Iowa and appear well adapted. This annual plant satisfactorily reestablishes from seed each year.

Good stands in Illinois and Iowa were lost in 1976 and 1977 due to weather extremes. In 1976 an early hard frost prevented development of viable seed. In 1977 an extremely dry summer in much of Iowa retarded growth of the beans so severely that few if any seeds were produced. These problems should not prevent the use of this valuable wildlife food plant.

Bobwhite soybeans should be established on a clean, well-tilled seedbed. Seeding can be made by broadcast, drill, or corn planter with small soybean plates. Herbicides used with field soybeans may be used to control weeds and allow a more vigorous stand the first year. A few broadleaf weeds do not severely limit the soybean because it will vine on plants growing nearby. Soybean vines have been measured up to 20 feet long. Five-foot vertical height is common.

Plantings have also been made alternating rows of soybeans with milo, millet, sudex, sudan, or other upright plants that could provide alternative food.

Site tolerance and fertility requirements are similar to field soybeans. Bobwhite will grow on sites with rather low fertility, but a much more vigorous stand can be maintained on deep, well-drained soils.

Management of the soybean, once established, is minimal. Some sites require little maintenance for several years; however, fertilizing, controlling weeds, and a light spring disking will result in a more productive food plot.

The plots need to be protected from livestock grazing. Deer, rabbits, and groundhogs have severely grazed some plots and appear to be the major problem in maintaining a stand.

Seed production is not difficult. It is desirable to have some tall weeds for the vining Bobwhite to climb. This raises the plants above the soil surface, making harvesting easier. In a weed-free plot, the plants will be quite close to the ground and many seeds will not be harvestable. There is always enough seed after harvest to regenerate the stand.

Seed is harvested by direct combining when the seed is mature and stems and leaves are dry. Seed yields at the SCS plant materials center, Elsberry, Mo., have ranged from 247 to 1,100 pounds per acre over 5 years. The average yield for the 5 years was 514 pounds per acre.

Bobwhite soybean was released in 1975 and seed was furnished to the Missouri Seed Improvement Association for planting in 1976. Commercial seed sources are not yet well established due to dry weather limiting seed production the past few years. Foundation seed is maintained at the Elsberry Plant Materials Center.

Mr. Henry is manager, Elsberry Plant Materials Center, SCS, Elsberry, Mo.
Mr. Brown is plant materials specialist, SCS, Columbia, Mo.

A Cold, Dry Reclamation Challenge

A coal company in Wyoming has put plants "on trial" to see if they can grow on mine spoil.

by Louis A. Engstrom
and Everet Bainter

A harsh climate and a complicated mining operation have not made surface mine reclamation easy for the Kemmerer Coal Company. But that hasn't stopped the company from making reclamation a part of its mining operation for the past 15 years.

The Kemmerer Coal Company has operated in southwestern Wyoming since 1897. Until 1950, the company mined underground but since then has worked open-pit mines.

The coal in the area is available because of the Rocky Mountain uplift and its faulting and erosion. If all the coal were in one seam, the seam would be 300 feet thick. The coal deposits, however, are in many different seams which, because of the uplifting, dip to the west at a 33 percent slope.

The quality of the coal varies from seam to seam and in order to supply an adjoining power plant with a uniform blend, the company now simultaneously mines 12 different coal seams ranging from 8 to 97 feet thick. In addition, some pits that were closed for economic reasons are now being reopened as the demand for coal increases.

Reclaiming areas interspersed with active mines, stored overburden, and stockpiles of topsoil requires tremendous coordination of all divisions of the company and makes reclamation complicated.

Early reclamation consisted of regrading spoil piles, acquiring seeding and mulching equipment, and establishing initial plantings of grasses. Success in the early years was limited because of a growing season of less than 90 days, annual precipitation of less than 9 inches, an average annual temperature of 40° F, and an average elevation of 7,300 feet.

In May 1975, the coal company, working through the Lincoln County Soil Conservation District, requested help from the Soil Conservation Service with trial plantings on mine spoil. The trials were set up to evaluate the suitability of commercially available grass species along with species being developed by the SCS plant materials center at Bridger, Mont.

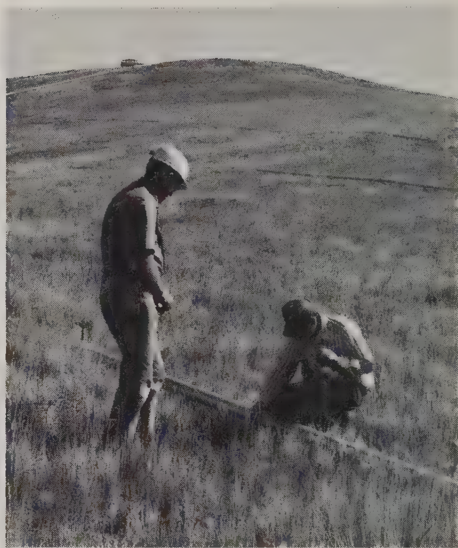
In one trial, seven test strips were established on 6.8 acres. Grasses were planted on spoil with 6 inches of topsoil and were not fertilized. The grasses used were 'Fairway' crested wheatgrass, 'Critana' thickspike wheatgrass, 'Whitmar' beardless wheatgrass, 'Rosana' western wheatgrass, Mammoth wildrye, 'Sherman' big bluegrass, and mixtures of Rosana western and 'Nordan' crested wheatgrass.

The test strips were irrigated once in the late summer of 1975 and twice in the late summer of 1976.

All of the grasses were drilled except the wildrye which was broadcasted. After planting, 2 tons per acre of mulch was applied.

At the same time, another 3 acres of spoil with 6 inches of topsoil was planted to Rosana western wheatgrass, Critana thickspike wheatgrass, Whitmar beardless wheatgrass, and 'Wytana' fourwing saltbush. The same amount of mulch was applied with no fertilizer and no irrigation.

All of the grasses did well and continue to thrive. Critana thickspike wheatgrass and Rosana western wheat grass are particularly vigorous. They now produce more pounds per acre than adjacent native rangeland. Because of their rhizomatous nature, basal cover is also better and soil erosion on these reclaimed areas is actually lower than on native rangeland.



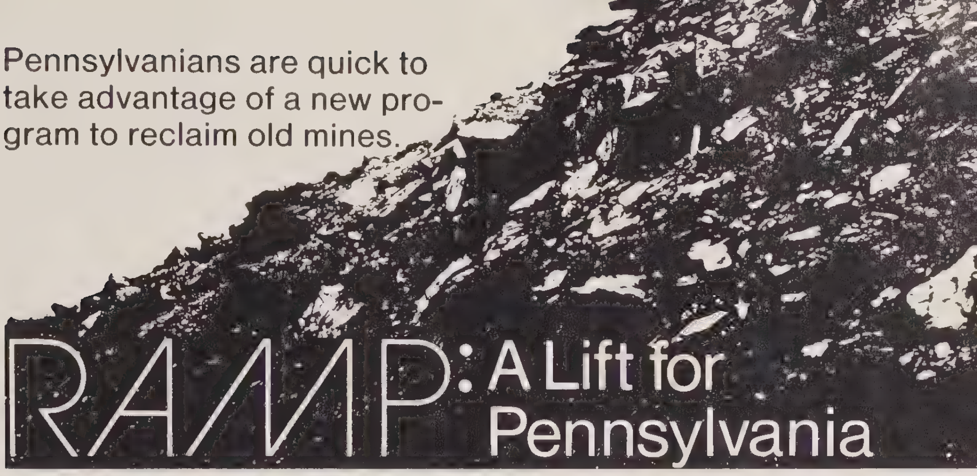
In one trial planting, a sprinkler system was used to irrigate the grass test strips late in the summer.

In addition to the trial plantings of grasses, the coal company is evaluating shrubs and woody species that were transplanted to mined areas. The native plants used included big sagebrush, aspen, serviceberry, and juniper. The plants have been successfully established.

The Kemmerer Coal Company is confident that it can meet the challenge of the cold, dry climate and return mined areas to desirable native vegetation.

Mr. Engstrom is reclamation engineer, Kemmerer Coal Company, Kemmerer, Wyo.
Mr. Bainter is range conservationist, SCS, Kemmerer, Wyo.

Pennsylvanians are quick to take advantage of a new program to reclaim old mines.



RAMP: A Lift for Pennsylvania

by Graham T. Munkittrick

Below, typical abandoned mine site includes crumbling highwalls, stagnant water, and sparse plant growth.

The Rural Abandoned Mine Program (RAMP) is a boon to Pennsylvania. The State has 240,000 acres that have been mined for coal and abandoned or inadequately reclaimed. That is more than in any other State.

Some of this land is an eyesore. It pollutes water and air. It endangers the public health and safety. Now, for the first time, funds will be available to help landowners heal the worst of it.

RAMP provides technical and financial assistance for reclaiming abandoned surface mines and areas where past deep mining for coal has left dangerous problems at the surface. It is authorized by the Surface Mining Control and Reclamation Act of 1977 and administered by the Soil Conservation Service.

During the first signup period last February, 640 Pennsylvania landowners applied for assistance on 13,000 acres—more than twice as many as expected. On February 28, county newspaper headlines warned that it was the last day for RAMP signup. Some SCS offices stayed open until 9 p.m. receiving applications, and one office reported that people were lined up to the street waiting to apply.

Landowners whose applications are approved will sign 5- to 10-year contracts with SCS. We will help them develop reclamation plans and apply conservation measures to protect human life and property; reduce adverse effects to public health, safety, and general welfare; and stabilize the mined land, control soil erosion, reduce sediment, and enhance water quality.

The cost sharing provided by RAMP is an important new incentive. Local soil and water conservation districts and SCS have helped mining companies

and private landowners restore mined areas for many years. The cost of reclaiming many abandoned areas, however, has been prohibitive—as much as $10,000 an acre in some spots.

Through RAMP, the Federal Government will pick up 75 to 100 percent of the cost for reclaiming up to 120 acres and a smaller percentage for 121 to 320 acres.

SCS in Pennsylvania received $1.7 million in cost-sharing money for fiscal year 1979 and $0.8 million for technical assistance. The money will be allotted to reclamation projects on a "worst first" basis.

First priority will go to areas that present an imminent danger to life and property—including problems such as land subsidence, slides, burning gob piles near populated areas, and hazardous mine waste impoundments.

Priority 2 areas have adverse effects on the public health, safety, and general welfare, but generally are not as close to populated areas as the Priority 1 sites. The problems may be open dumps on mine spoil, hazardous highwalls, acid drainage or sediment, and eyesores in areas generally used by the public.

Priority 3 areas may not directly harm people or damage property, but they are so disturbed that they degrade the environment and cannot be used for any gainful purpose, such as pasture or woodland.

Determining which RAMP projects will be funded first requires careful judgment, and SCS feels that the choices of a team working together will be better than those any individual would make.

The SCS district conservationist first investigates each site and places each RAMP application in the first, second, or third priority group. A local RAMP committee then reviews the assignments. The committee, appointed by the soil and water conservation district board, might include local representatives of the State Fish Commission, Bureau of Forestry, and Game Commission; a mine inspector; and a conservation district director.

A State RAMP committee then reviews the high-priority applications from each county and ranks the projects on a statewide basis. The State committee is made up of representatives from the State Association of Conservation Districts, the State Department of Environmental Resources, the coal industry, U.S. Department of the Interior's Office of Surface Mining, and others.

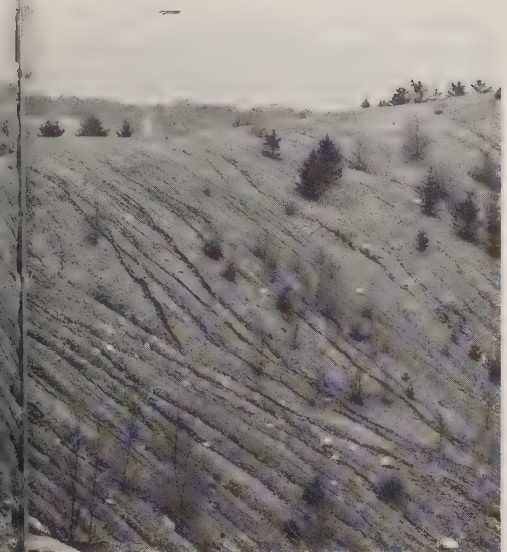
In the first signup, SCS received 235 Priority 1 applications covering nearly 5,900 acres; 253 Priority 2 applications covering 4,700 acres; and 152 Priority 3 applications covering 2,500 acres. During the next few years, we will be funding mainly Priority 1 projects, but we will begin planning reclamation work on some Priority 2 projects as well.

Of the 240,000 acres of abandoned mined land in Pennsylvania, about 60,000 acres have the kinds of problems that require RAMP assistance. For example, water in strip mine pits can percolate into ground water and reappear elsewhere as acid drainage. There already are too many acid streams in Pennsylvania. RAMP will help fill in these pits and improve drainage so that more water does not collect there.

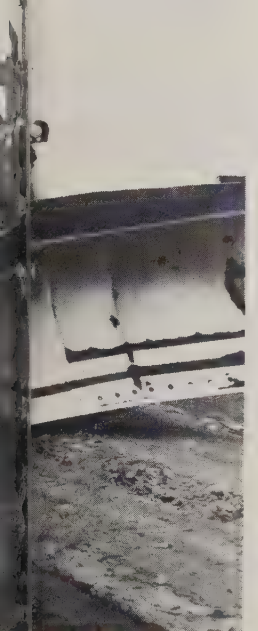
Most RAMP sites will require a combination of plants and structural measures for effective reclamation. Two especially useful plants now available for planting were tested at SCS plant mate-

At right, many surface-mine spoil banks are steep, bare, and scarred with gullies.

A bulldozer constructs diversion terraces on restored strip mine land. The land will be returned to agricultural use.



Below, among the surface remnants of deep mining in Huntingdon County, Pa., is this junkpile of coal cars that donkeys once pulled.



Former SCS District Conservationist Dale Burns inspects good growth of 'Tioga' deer tongue, an excellent plant for healing surface-mined land.

rials centers in Quicksand, Ky., and Big Flats, N.Y. 'Tioga' deertongue, an acid-tolerant grass, is used to stabilize areas where very few other grasses will grow. 'Arnot' bristly locust, a thicket-forming shrub, spreads quickly and forms a ground cover under very acid conditions. It also produces cover for wildlife and attractive flowers.

Structural reclamation measures may include water diversions, stone-center waterways, and sediment basins to filter sediment in runoff. Some reclamation plans may call for temporary structures. For example, a landowner may install a diversion to protect the area until the vegetation is established. When the slope is stabilized, the diversion is smoothed out. Reclamation plans also may include soil grading, reconstruction, and soil amendments to create better conditions for plant growth. Wherever possible, landowners will use the soil material on the site for reclamation. Otherwise, costs will go up, and they will be left with two disturbed areas instead of one—the mine site and the area from which the material was "borrowed."

Under the Surface Mining Control and Reclamation Act, SCS and conservation districts also are cooperating with the Pennsylvania Department of Environmental Resources on reclamation assistance in active mining.

SCS provides technical assistance on the reconstruction of prime farmland. SCS also supplies soil surveys and provides technical assistance to mine operators to develop and apply reclamation plans as part of the mining process. This spring, for example, SCS and the State Association of Conservation Districts are conducting two series of training sessions—one for

The drag line is in the process of removing overburden to reach the coal seam. The bulldozer in the foreground is restoring the land to its original contour.

mine inspectors and another for mine owners and operators.

The State recently granted conservation districts authority to review and comment on all active mining reclamation plans. They also have review responsibilities under Pennsylvania's Clean Streams Law. Districts have been strongly interested in mined-land reclamation because they end up having to cope with the long-range environmental effects of surface mining. Most district directors want to help head off problems before they come home to roost. Thus, the fresh interest in RAMP and increased requests for technical assistance in planning reclamation for active mines are most welcome.

SCS, conservation districts, and mine operators will have to look at the long-term plans in each watershed. More than half of the streams in this State are polluted by minewaste discharges. I hope that we can use all of the conservation programs to do a cleanup job by watersheds. We will coordinate our efforts with programs such as Pennsylvania's "Operation Scarlift"—a mine reclamation program financed by State bonds—and with all other State and Federal agencies that have mine reclamation and land treatment programs. Together, we can achieve a total watershed approach.

We will make the reclaimed sites compatible with surrounding land uses—forest-to-forest and farmland-to-farmland. Stormwater control measures also will have to be included in reclaiming both active and abandoned mines. Last year, Pennsylvania passed a stormwater management law.

Last fall, I met with the SCS State conservationists of Ohio, Kentucky, and West Virginia to discuss RAMP and active mining programs. We want to develop a compatible approach to reclamation so that mining companies that work across State lines will have one set of guidelines.

The Surface Mining Control and Reclamation Act has done more than set up rules and regulations for mining companies. It has led to greater communication and cooperation among government agencies at all levels, conservation districts and other organizations, the coal industry, and local conservation contractors.

The extra communication and cooperation will bring about more—and more effective—reclamation to heal the scars and prevent others. The results will be a better environment and prouder communities throughout Pennsylvania and all other coal-producing States.

Mr. Munkittrick is State conservationist, SCS, Harrisburg, Pa.

What's a Priority 1 Site?

A typical Priority 1 abandoned mine site in Pennsylvania probably has these characteristics:

- Conditions at the site present substantial danger of harm to life or damage to property—as determined by field examination.
- There is no continuing responsibility by anyone to reclaim the area.
- The land is not under lease to be mined again in the foreseeable future.
- The site is about 40 acres. It is identifiable as a separate mined area. Some Priority 2 or 3 mined land may be nearby.
- The surface mine was cut deeply into the hillside; spoil piles and the surrounding hills are steep. Drainageways are narrow.
- The land has very little vegetative cover—perhaps low-grade timber at best—and probably is scarred with big gullies.
- The spoil piles are acid; so is the water that sits on or runs off the site; so is the adjacent stream.
- A highwall is sloughing off into the stream channel.
- There are very steep gob piles from deep mining on or near the area.
- Reclamation will cost several thousand dollars an acre.
- After reclamation the landowner probably will use the area mainly for wildlife habitat.

Water for All Seasons

by James W. Scott

Cool spring water during hot, dry summers and a flowing spring in below-freezing winters are a livestock owner's dream. The hot summer sun has little effect on the water temperature in spring-fed tanks and it is not uncommon on cold winter mornings to see steam rising from the same tanks since spring water is naturally "heated." It is a source of water for all seasons.

Lester Burkland of Olsburg, Kans., needed water for his cattle on a 75-acre pasture. He knew that he had a perennial spring in the bank of a gravelly draw near the pasture, but the soil and geology of the pasture were such that any dam constructed would probably leak. Burkland decided that developing the spring would be the best way to supply the water he needed for his cattle.

In May 1977, he applied for cost sharing for the spring development through the Agricultural Conservation Program administered by USDA's Agricultural Stabilization and Conservation Service. He also requested help from the Soil Conservation Service in designing the development and providing on-site inspection during and after construction.

When Burkland was ready to develop his spring, he hired a contractor with a track-driven high loader to do the job. The high loader scooped out the wet soil and prepared a trench for the collection pipe. The trench was cut down to shale. A section of 4-inch perforated PVC pipe was laid the full length of the spring seepage area, then the construction crew backfilled the trench with gravel.

The crew set a 6-foot joint of 24-inch-diameter corrugated metal pipe upright to serve as a spring box. They cut a 4-inch diameter hole in one side of the 24-inch pipe about 2 feet from the bottom and inserted the collection pipe. The supply pipe running into the tank fits into a 2-inch hole on the opposite side. About 2 inches of concrete was poured into the bottom of the 24-inch pipe. The crew then backfilled clay soil around the 24-inch pipe and compacted it to prevent seepage from the collection trench.

Burkland gets 10 to 15 gallons per minute flow into his stock tank. He expects the flow to be about 5 gallons per minute during a drought. He is satisfied that the spring will be a permanent, year-round water source.

Mr. Scott is district conservationist, SCS, Westmoreland, Kans.

Lester Burkland's livestock watering tank is full year round thanks to his spring development.

News Briefs

USDA-TVA Pact Targets Tennessee Erosion Problems

According to Agriculture Secretary Bob Bergland, the "time has come to get serious about controlling soil erosion and agricultural pollution before it threatens the very future of U.S. food production and our water supplies."

Bergland was speaking at a ceremony in Dyer, Tenn., in March marking a new cooperative agreement between the U.S. Department of Agriculture and the Tennessee Valley Authority. He said that soil erosion and the environmental problems associated with it are very serious and underrated national problems that are approaching the crisis stage.

"If the erosion challenge is not met quickly and forcefully," he said, "this Nation's unparalleled agricultural productivity will decline, water shortages will grow, and pollution from our farmland will diminish the country's water quality and the health of Americans." The signing of the agreement by Bergland and S. David Freeman, TVA board chairperson, brings together Federal, State, and local agencies in a concentrated single attack on soil losses and deteriorating water quality in one of the most severely eroding areas in the Nation.

Bergland said conservationists estimate that annual soil losses from erosion by water amount to 30 to 40 tons per acre of cropland in western Tennessee—six or eight times the national average—and in some counties where intensive farming methods are widespread, as much as 100 tons an acre.

Noting that topsoil is disappearing from many farms twice as fast as it can be replaced, Bergland said the "continued destruction of cropland is wanton squandering of an irreplaceable resource that invites future tragedy not only nationally, but on a global scale."

He said he was gratified by Tennessee's recognition of the urgent need to mobilize a comprehensive program to stem soil erosion and agricultural pollution.

The USDA-TVA agreement, Bergland said, reaffirms the commitment to residents of the Tennessee Valley region that they will receive full benefits from the services and programs offered by the two organizations.

"We share western Tennesseeans' concerns about their agricultural base, about their communities, and about the natural resources on which they depend," he said.

Bergland said a continued education effort, such as that being undertaken in the Tennessee Valley, is essential to persuade farmers that it is in their long-term interest to invest in soil and water conserving practices.

"Our biggest hope lies in new and innovative local approaches to conservation that are economical and long term," he continued. "We can assist, but we need fresh ideas for protecting resources to meet the needs and technology of the 1980's."

Although soil conservation programs, aided by the Federal Government, State agencies, and local conservation districts, have helped to keep erosion problems from becoming even worse, Bergland said, "we have not been the best or most consistent stewards of soil and water.

"We cannot afford to jump in and out of conservation every 5 or 10 years," he contended. "Conservation measures must be kept on the land permanently if we are to maintain our agricultural productivity.

"Time after time in recorded history, civilizations have flourished and then died because they failed to nurture their soil and water resources," he added. "There should be a lesson there for each of us."

USDA, EPA Agree on Rural Program Cooperation

The U.S. Environmental Protection Agency (EPA) and the U.S. Department of Agriculture (USDA) renewed an agreement to share employees, funds, and facilities to clean up rural waterways, protect important farm and forest

lands from development, create sound pest control programs, and cooperate in other areas of mutual interest.

Last January, Agriculture Secretary Bob Bergland and EPA Administrator Douglas M. Costle signed a 5-year "memorandum of understanding" to pursue "common objectives, interests, and statutory requirements, and to avoid duplication of effort." The new agreement replaces a 1974 cooperative pact.

"Healthy soil, water, and air are essential to a healthy American agriculture," said Bergland, "so it's only natural that we work with EPA to protect these resources and to use them in environmentally acceptable ways."

"EPA relies upon USDA's experience with the needs of farmers to help us make decisions that benefit them as well as the public at large," Costle said. "The relationship between the agencies sometimes has been stormy in the past, but Bob Bergland and I have been working together on joint problems since our appointments 2 years ago."

Specifically, the agreement commits the two departments to share information, use one another's facilities, transfer funds, loan employees, and review one another's programs.

The agreement would allow the creation of joint "task forces" on research, land use, pest management, air and water cleanup, solid waste management, international programs, education and communication, and Federal-State cooperation.

An annual conference, chaired by the agency heads, would be used to monitor progress under the pact.

Landscaping With a Beautiful Redhead

by Jimmy Henry

'Flame' Amur maple (Acer ginnala) is an attractive, dense shrub or small tree that grows to a height of 15 to 20 feet and a crown width of 14 to 18 feet. It is multistemmed, branching at or near ground level, but it can be pruned to a single main stem if desired for landscaping.

Flame is one of the earliest woody species to leaf out in the spring and is fully leaved before blooming. The blossoms are yellow but inconspicuous, appearing usually the latter part of April to May 10th.

The double-winged fruits turn a bright red in the summer while leaves are still green. In the autumn the leaves turn a fiery red color, providing attractive scenery. The fruits have no wildlife value, but several bird species have been seen nesting in the branches.

Flame Amur maple has been released by the Soil Conservation Service at the plant materials center (PMC), Elsberry, Mo.

Seedlings of Flame Amur maple are easy to grow from seed and produce vigorous plants. It is also easy to establish seedlings in plantings such as those for landscaping, beautification, screening, farmstead windbreaks, and recreation areas. It has been tested in numerous field evaluation plantings in Iowa, Illinois, Missouri, North Dakota, Michigan, Nebraska, Oklahoma, and Kansas to determine its area of adaptation. Flame is extremely winter-hardy and has been planted with good survival as far north as Canada. It has also been planted as far south as southern Oklahoma and Tennessee.

Plantings of Flame perform well on a wide range of soil types but prefer medium to well-drained soils.

Propagation by commercial nurseries will be from open-pollinated seed.

Seed and plants to establish seed orchards of Flame were recently made available to commercial growers in limited quantities from the Elsberry PMC.

Mr. Henry is manager, Elsberry Plant Materials Center, SCS, Elsberry, Mo.

New Conservation Plants Released

The Soil Conservation Service and cooperating agencies released three new conservation plants during January and February 1979.

'Cimarron' little bluestem was released by the SCS plant materials center in Manhattan, Kans., for use in range and critical area seedings in western and central Kansas, the Oklahoma and Texas Panhandles, eastern Colorado, and southern Nebraska.

The SCS plant materials center in Elsberry, Mo., released 'Elsberry' autumn olive and 'Cling-Red' Amur honeysuckle for wildlife improvement, windbreaks and shelterbelts, screens or border plantings, and roadside beautification. Elsberry is adapted to Illinois, southern Iowa, Missouri, Kansas, and central and southeastern Nebraska. Cling-Red is adapted from New Jersey to Nebraska and from eastern Texas to North Dakota.

Research Roundup

Predicting Wind Erosion Protection of Range Grasses

Range conservationists now have a way of predicting susceptibility of grassland to wind erosion as well as estimating the grass cover needed for holding potential wind erosion to tolerable levels.

Management systems for controlling wind erosion on land devoted to principal crops are designed by use of a mathematical equation developed in 1965 by Neil P. Woodruff and Francis P. Siddoway, soil scientists of the U.S. Department of Agriculture.

Wind tunnel studies by Leon Lyles of USDA's Science and Education Administration now extend use of the equation to rangeland as well. Lyles' research furnishes information requested by USDA's Soil Conservation Service, a principal user of the equation.

The equation expresses potential soil loss as the interacting effects of soil erodibility, soil ridge roughness, the unsheltered distance across a field along the prevailing wind erosion direction, and vegetative cover.

Lyles, an agricultural engineer at Manhattan, Kans., has provided data for expressing erosion protection of range grass cover in terms required by the equation—that of an equivalent amount of small grain stubble lying flat on the soil surface in rows perpendicular to wind direction.

The agricultural research engineer found, for example, that the dry vegetation remaining after properly grazing buffalograss gives the same erosion protection as about eight times as much small grain stubble. Buffalograss was the most effective and big bluestem the least effective of eight perennial grasses when soil loss was measured in a wind tunnel during 5-minute exposure to a 30-mile-per-hour wind.

Other grasses tested individually or in mixtures included sideoats grama, western wheatgrass, needle-and-thread grass, little bluestem, switchgrass, and blue grama.

Two grass mixtures gave virtually identical erosion protection, Lyles found. One was 45 percent western wheat, 30 percent needle-and-thread, and 25 percent blue grama clipped to leave 4 inches of dry vegetation. The other was 45 percent blue grama, 30 percent buffalo, and 25 percent western wheat with 2 inches of dry vegetation.

A mixture in which big bluestem predominated, along with little bluestem and sideoats grama, gave less erosion protection.

Lyles ran tests simulating ungrazed, properly grazed, and overgrazed management levels and also devised a procedure for determining equivalent vegetative cover of other grasses or mixtures.

A Soil and Water Lab for Appalachia

Construction is underway on a new U.S. Department of Agriculture laboratory for the study of soil and water problems in the central and northern Appalachian region.

The new facility, to be administered by USDA's Science and Education Ad-

ministration (SEA), is located in Beckley, W. Va.

When completed, the Appalachian Soil and Water Conservation Research Laboratory will provide space and facilities for 16 research scientists plus 35 to 40 technicians, field workers, and other support staff. Facilities will include eight laboratories and six greenhouses, plus growth chambers, shops, and storage buildings on a 42.7-acre site.

Scientists at the Beckley laboratory will deal with a variety of problems associated with hill-land agriculture and reclamation of surface mined and other disturbed land. The research will have special application to revegetating surface mine spoils by developing practices to minimize soil and water loss from these areas.

Another research goal is to develop conservation cropping systems. One approach is no-tillage and other conservation tillage systems that aid in crop production and at the same time reduce soil and water losses. Another is establishing and maintaining legumes in hillside pastures, which may involve special seeding and fertilization techniques.

Scientists at the lab will also be working on methods to use water more efficiently. This is particularly important on the shallow soils and steep slopes that are typical of the Appalachian region. Ways will be developed to conserve the available water and to prevent water pollution from runoff and erosion.

Water and Nitrogen Management Take Extra Effort on Sandy Soil

Keeping fertilizer nitrogen where an irrigated crop can use it is not easy on sandy soil, U.S. Department of Agriculture research shows.

A study by Lloyd N. Mielke and James S. Schepers of USDA's Science and Education Administration identifies related fertilizer and water management problems with center pivot irrigation on sandy soil.

Whenever rainfall is greater than what can either be stored in the soil or used by the crop, some of the excess is likely to percolate down beyond the root zone, carrying nitrate–nitrogen with it. And that lost nitrogen is a potential ground water pollutant.

In addition, if more nitrogen than the crop can take up is put on in the spring or late in the growing season, nitrate–nitrogen may similarly be carried beyond the reach of roots.

The Lincoln, Nebr., soil scientists found that water and nitrate–nitrogen losses below the root zone followed similar patterns. But the nitrate–nitrogen concentration in the percolating water generally decreased as the season progressed.

On a Bellwood, Nebr., farm, corn under center pivot irrigation received 186 to 235 pounds of nitrogen annually in 1975–78. The farm operator generally put on preplant and starter fertilizer plus additional nitrogen in the water applied by center pivot. The added nitrogen was either a combination of anhydrous ammonia and 28-percent nitrogen solution or the nitrogen solution alone.

May through September rainfall reached the normal 19 inches for the area only in 1977, and was 5 to 9 inches below normal the other 3 years. Eleven to 14 irrigations per season added 9 to 13 inches.

With 23 to 28 inches of water received on the land by rainfall and irrigation, 2.2 to 3 inches percolated below the root zone in July and August, the scientists found. Seventeen to 44 pounds of nitrate–nitrogen per acre moved with it.

But 78 instead of 44 pounds of nitrate–nitrogen was lost in 1978 in percolating water where an extra 100 pounds per acre had been applied shortly after planting. The added nitrogen did not affect corn yield, demonstrating that amounts beyond crop needs may be lost.

The effects of more water than the soil could hold were illustrated in the wet spring of 1977, when more than 7 inches of rain fell from mid-May through June. Water loss by deep percolation during that time was 10 percent greater than the July–August total. But twice as much nitrate–nitrogen was carried below the root zone.

Center pivot systems are likely to be used on much of the land brought under irrigation in the future, Mielke and Schepers believe. Land topography will often not be well suited to surface irrigation. On sandy soil particularly, careful water and nitrogen management will be essential to profitable, pollution-restricting operations.

New Publications

Cooperative River Basin Studies: Helping Planners

by the Soil Conservation Service

What is a river basin study? Why is a river basin study needed? Who carries out the study? What information can a river basin study supply?

These are some of the questions answered in this 12-page, color brochure.

The brochure will be of interest to those who have responsibility for resource planning at the local, State, or national level. It will be useful for anyone who needs accurate technical data on the current and projected availability and condition of natural resources.

The publication explains who may request a river basin study and how the request is prepared and submitted. It also explains how the information provided by the study can be used.

Copies of the brochure are available from local or State Soil Conservation Service offices.

Montana Grazing Guides

by the Soil Conservation Service

A new publication is now available explaining time-tested and proven Soil Conservation Service guides to proper management of Montana's rangelands, grazable forests, and tame pastures.

This is the first time that SCS procedures and rationale for determining range site condition and suggested stocking rates have been collected into one publication.

The publication explains the goal of successful range management and the concept of different range sites based on a combination of soils and annual precipitation or forested grazing sites based on geographic area, soils, and forest overstory and canopy density.

There are 10 guides to range sites in five geographic areas of the State; nine guides to forest grazing sites in eight geographic or dominant forest species areas; three guides to nonirrigated tame pastures in three geographic areas; and three irrigated pasture management guides for different production units. All of the guides give some recommendations for stocking rates.

Maps of the different areas are included in the publication.

"Montana Grazing Guides" is available from the Soil Conservation Service, P.O. Box 970, Bozeman, Mont. 59715.

My Conservation Book

by the Baltimore County
Soil Conservation District

A 34-page coloring book has been developed for elementary school children. Its purpose is to instill the basic concept of soil and water conservation and the importance of environmental balance in children at the third to sixth grade level.

The book is designed so that students can learn and have fun at the same time. It includes definitions of common conservation terms such as soil, sediment, watershed, and stripcropping. Children can learn about the effects of soil erosion and where to look for it in their environment and what can be done about controlling erosion on farm, range, woodland, and in urban areas.

Included in the book is a section on conservation districts and the Soil Conservation Service. The book offers one exercise, for example, in which the children locate their local conservation district and find out the person in charge.

"My Conservation Book" can be purchased from the Baltimore County Soil Conservation District, 9811 Van Buren Lane, Cockeysville, Md. 21030. Price information is available from the conservation district.

Preserving America's Farmland

by the League of Women Voters

"Each year some 1 million acres of prime farmland—that is, land best-suited for producing food, fiber, and other crops—are converted to urban uses. Scattered development breaks up and isolates another million acres, making commercial farming of this land impractical. If this rate of conversion and checkerboarding continues, some experts think that our ready reserves of high-quality farmland could be depleted by the early 1990's."

This is the picture painted by the article on preserving important farmland. The publication outlines factors contributing to the loss of farmland, describes current State and local programs for preserving farmland, and evaluates the effectiveness of these efforts.

A section entitled "Federal Efforts to Preserve Farmland" includes actions taken by the U.S. Department of Agriculture, the Council on Environmental Quality, the U.S. Environmental Protection Agency, and Congress.

A short bibliography and a list of National Science Foundation studies in the area are also presented.

Copies of Publication No. 265 are available for 40 cents from the League of Women Voters of the United States, 1730 M Street, N.W., Washington, D.C. 20036.

List of Published Soil Surveys

by the Soil Conservation Service

This publication lists soil surveys that have been published by the U.S. Department of Agriculture since 1899. Information is given on how to obtain copies of surveys that are still in print and how to find out the current status of a soil survey not included in the publication.

Soil surveys provide soil maps and interpretations needed in giving technical assistance to farmers and ranchers; in guiding other decisions about soil selection, use, and management; and in planning research and disseminating the results of the research. They are also used in educational programs about soil use and conservation.

Copies of the list are available from local or State Soil Conservation Service offices.

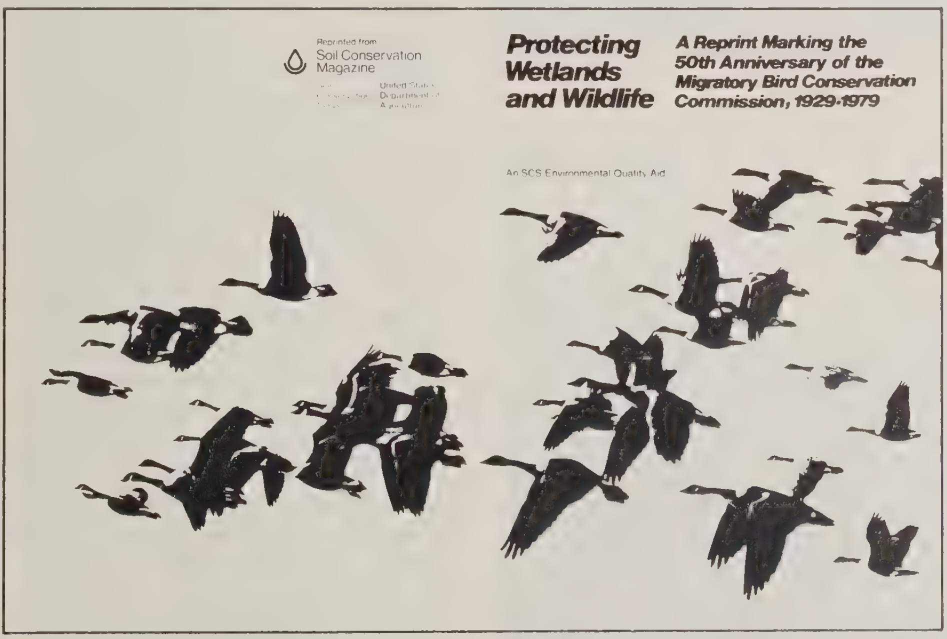
Trees, Soils, and People

by the Soil Conservation Service

This publication is a collection of seven articles on trees and woodlands reprinted from *Soil Conservation* magazine. It includes articles about: managing a small woodland to provide material for a woodworking hobby; woodland management for long-term investment; managing trees and woodlands for esthetics, wildlife, and recreation; and managing field and farmstead windbreaks.

One of the articles describes a woodland management project that provided jobs and training to unemployed people and another gives information about forest-cutting and logging practices that help prevent erosion and improve water quality.

Single copies are available from local and State Soil Conservation Service offices.



Protecting Wetlands and Wildlife

by the Soil Conservation Service

Ten articles from *Soil Conservation* magazine have been reprinted in this publication to commemorate the 50th anniversary of the Migratory Bird Conservation Commission.

The articles discuss conservation practices, such as windbreaks and farm ponds, that give wildlife a boost; the Water Bank Act, which aims to help landowners preserve, restore, and enhance wetland for use as wildlife habitat; and a wildlife conservation plan for a national wildlife refuge.

Other articles give information on specially designed ponds for waterfowl and other wildlife and "floating islands" to provide resting and nesting spots for waterfowl; converting surface mine pits into a marshland; suburban sediment ponds that became homes for wildlife; and a countywide project to erect wood duck nesting boxes.

Copies of this publication are available from local and State Soil Conservation Service offices.

An Uncommon Hold on Water

by Bruce C. Hennie

Top, waterline erosion is a common problem for many farm ponds, watershed structures, lakes, and streams in Texas and Oklahoma. Bottom, the thick root system of 'Shoreline' common reed controls erosion and stabilizes banks where the waterline remains constant during its first year's growth.

Erosion on earthen dams, ponds, and other waterline areas can be controlled by a new strain of common reed.

The Soil Conservation Service and the Texas Agricultural Experiment Station of Texas A. & M. University have jointly released 'Shoreline' common reed (Phragmites australis) to qualified growers. Not a seed-producing plant, it must be reproduced using rootstock plantings—what botanists refer to as rhizome propagation.

Shoreline has been extensively tested for more than 8 years in over 50 watershed areas and can grow on most soil types. It matures faster in areas having 30 or more inches of rainfall a year, but grows anywhere in Texas or Oklahoma where the waterline remains constant during its first year's growth.

The main conservation use of common reed is stabilizing the water's edge on ponds and lakes and around earthen dams. The thick rhizomes, or root system, hold soil in place, preventing erosion and weakening of the shoreline. The greatest success in SCS testing has been to combine Shoreline with 'Alamo' switchgrass. Common reed takes hold on the waterline and switchgrass provides ground cover a short distance inland.

As reflected in its name, common reed is one of the most common grasses in the world, growing mostly in marshes, along rivers, and at streamsides and canal banks. Shoreline is a horticulturally derived variety, developed from a natural strain discovered by SCS personnel on a railroad right-of-way in Kaufman County, Tex., in 1970.

Once established, Shoreline common reed lasts for years—its straight stems sometimes reach 10 feet in height, although a first year growth of

only 3 feet is common; its leafy blades range from 1/2 to 2 inches in width. The rhizomes will not take root when submerged; but once the plant stem has started to grow, water levels can be raised up to 2 feet from ground level.

The plant's most distinctive feature—branched, irregular flower clusters—turns a rich purple in the early weeks of autumn. By winter the graceful plumes turn a light tan.

An interesting sidelight to Shoreline is its historical role as a food supply for American Indian tribes. Backpackers and campers still think of common reed as a fine emergency food plant. The rhizomes are the most edible part. Roasted under ashes, their taste can be compared to the "jackets" of baked potatoes.

Cattle also like Shoreline and have destroyed stands by severe overgrazing. To maintain common reed for shoreline protection, SCS recommends preventing livestock from grazing it at any time. Wildlife often use Shoreline as cover, but do not graze the grass.

Farmers looking for ways to attract mallard, blue teal, or pintail ducks may be interested in common reed as nesting habitat. The ducks nest on dry ground at the edge of common reed stands.

Shoreline will be commercially available from at least two growers by 1980. Others who would like to establish production blocks of common reed rootstock should contact the SCS plant materials center in Knox City, Tex.

Mr. Hennie is public information specialist, SCS, Temple, Tex.

Meetings:

June	
3–7	American Institute of Architects, Kansas City, Mo.
4–8	General Federation of Women's Clubs, New Orleans, La.
5–7	The Garden Club of America, Milwaukee, Wis.
11–13	American Plywood Association, Portland, Oreg.
17–21	Outdoor Writers Association of America, Albuquerque, N. Mex.
24–27	American Society of Agricultural Engineers, Manitoba, Winnipeg, Canada
24–28	American Seed Trade Association, Inc., Washington, D.C.
24–29	Air Pollution Control Association, Cincinnati, Ohio
24–29	American Water Works Association Conference, San Francisco, Calif.
29–July 1	National Audubon Society Convention, Estes Park, Colo.
29–July 2	American Association of School Administrators, Denver, Colo.
July	
10	No-Tillage Systems Conference, Lexington, Ky.
14–28	National Association of Counties, Kansas City, Mo.
19–21	Izaak Walton League of America, Inc., Anaheim, Calif.
22–26	National Federation of Business and Professional Women's Clubs, Inc., Boston, Mass.
28–Aug. 1	American Association of Nurserymen and Southern Nurserymen's Association Convention and Horticultural Trade Show, Atlanta, Ga.
29–Aug. 1	American Agricultural Economics Association, Pullman, Wash.
29–Aug. 1	Land Application of Waste Materials Conference, Ottawa, Ontario, Canada
29–Aug. 1	Soil Conservation Society of America, Ottawa, Ontario, Canada
August	
5–8	National Farm & Power Equipment Dealers Association, Detroit, Mich.
5–10	Joint Meeting of the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America, Fort Collins, Colo.
12–16	Conservation Education Association, Dingmans Ferry, Pa.
19–22	American Institute of Chemical Engineers, Boston, Mass.

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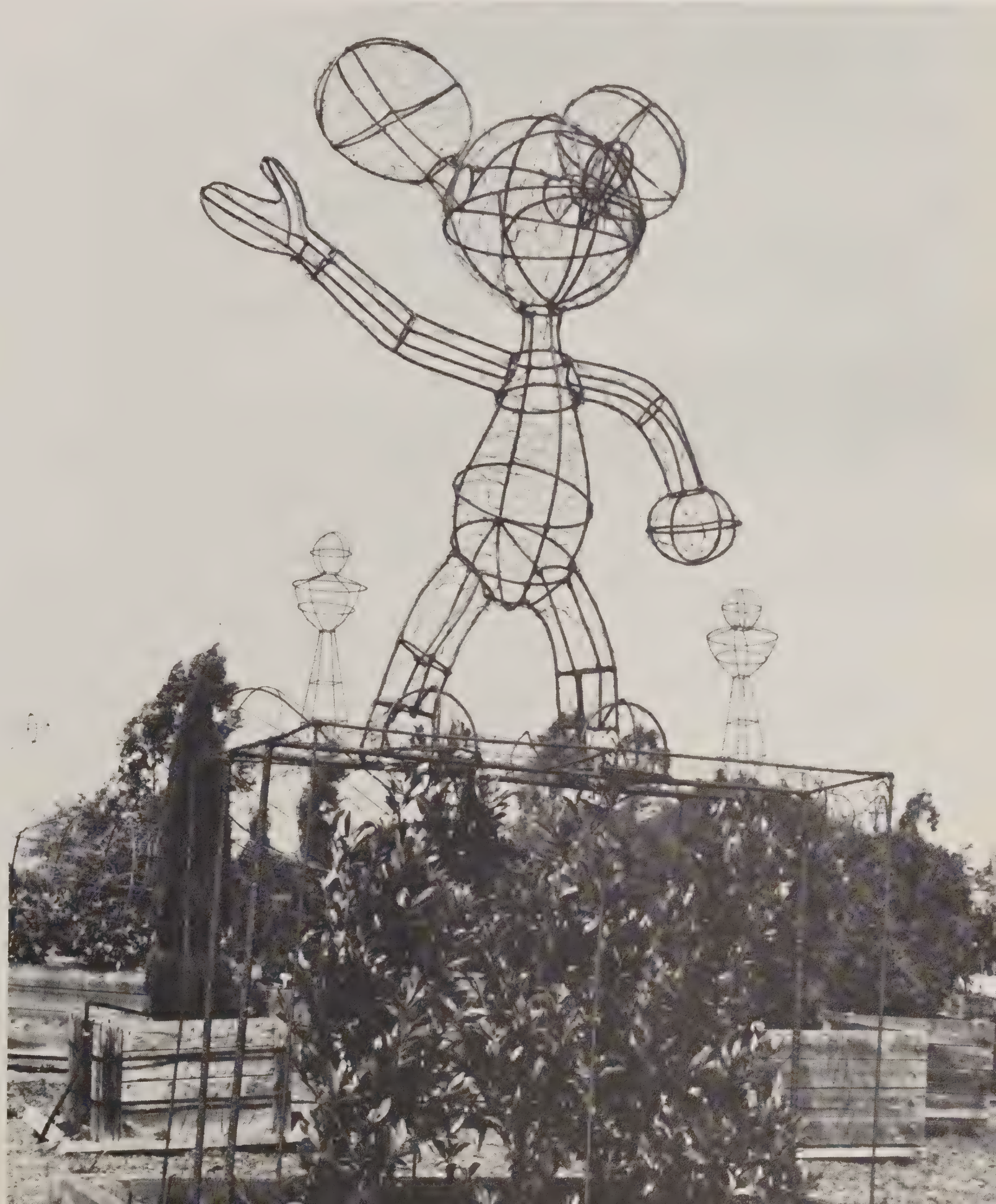

From the Administrator

Water for Tomorrow

In the middle of a good irrigation year in many States, it is time to think about getting ready for the not-so-good water supplies of next year or the year after—or of next month!

Water conservation and efficiency in water use are urgent in *all* years and in *all* States. They affect sustained food and fiber production, availability of water for other purposes, and quality of water for all purposes. They also affect farm energy costs.

Irrigation does need more research—of 13 top-priority water research needs recently identified by USDA's Science and Education Administration, seven relate to irrigated agriculture.

Other questions were raised at public meetings led by Secretary Bergland earlier this year. For example:

- How would a statewide or regional agricultural water shortage affect the Nation's food and fiber supply?
- What economic and social problems would result from the loss of surface or ground water resources, and how should we address them?
- Should there be a major effort to "import" water to areas that have too little from areas that have plenty, or are there other ways of matching water resources with high-quality lands to achieve food and fiber for future needs?
- Who should make these decisions, and who should carry them out?

Some answers may arise from the Soil and Water Resources Conservation Act (RCA) program and appraisal process. RCA requires that USDA weigh alternative irrigation techniques and their costs; benefits; and effects on soil and water conservation, crop production, and environmental quality.

Other answers are coming from special efforts such as the Wellton-Mohawk project in Arizona and the larger Colorado River Basin Salinity Control Program, where farmers aided by SCS are proving that efficient irrigation cuts water use, improves downstream water quality, and produces excellent crops.

Few land users or States can afford to wait until they have all the answers. Utah already has a more-than-$20-million program of no-interest loans to farmers for installing irrigation improvements that farmers have planned with SCS help. SCS and local conservation districts have aided thousands of land users in nearly every State with planning, installing, and improving irrigation methods and systems.

As irrigated acreage and the demand for food and fiber continue to increase, now is the time for a redoubled effort to aid land users in best use of water now and in the future.

Mel Davis

July 1979, Vol. 44, No. 12

Soil Conservation

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Contents

Cover:

- **Front—Topiaries are used for landscaping throughout Walt Disney World in Florida. This one of Mickey Mouse will take 5 years to train before it can be transplanted onto the grounds. Like other ornamentals grown in the Disney nursery, Mickey is drip irrigated with sewage effluent.**
- **Back—"Treehouse" rental units at Disney World were designed according to soil potentials. These soils are subject to flooding, so the main part of the house is off the ground where water can do no damage. See article beginning on page 12. (Photos, Anne Schuhart.)**

by Norman A. Berg

Good Land Care: Cleaner Great Lakes

Sediment from farms in "hydrologically active areas" may be responsible for as much as 60 percent of the phosphorus that finds its way into the Great Lakes. Controlling it will improve water quality and protect soil productivity.

Adapted from a presentation by Mr. Berg at a special conference in Rochester, N.Y., on April 19, 1979. The conference was sponsored by Cornell University and the International Joint Commission.

In less than 200 years, a third of the heavily forested Great Lakes Basin—almost 19 million hectares—has been shifted to cropland and pasture. More than 3 million hectares, or 5 percent of the basin, is now residential, commercial, and industrial. In the next 50 years, another 1 million hectares may be shifted into these urban-type uses.

Both Canada and the United States have profited greatly from these land use changes: The Great Lakes Basin includes the heart of North America's industrial establishment and produces a substantial part of its food and livestock feed. It is home for 35 million people now, and that total may reach 54 million in the next half century.

Yet these changes in land use and attendant population needs also have brought a cost in reduced water quality. Accelerated eutrophication in the lower Great Lakes, and in certain nearshore areas of the upper lakes, has resulted from high levels of phosphorus (loadings). Even with point-source controls in place in both nations, target loadings for phosphorus cannot be met without also reducing phosphorus delivery from diffuse sources, including agricultural lands.

Phosphorus was one of many pollutants studied by a special group at the request of the International Joint Commission (IJC). The Pollution from Land Use Activities Reference Group, or PLUARG, took an indepth look over a 6-year period at:

1. Resource conditions and trends;
2. Efforts already underway;
3. Possible solutions for water-quality and other problems; and
4. Some strategies mandated by the Great Lakes Water Quality Agreements of 1972 and 1978.

PLUARG's final report and a series of technical reports went to IJC last year.

The Findings

PLUARG found that 24 percent (10,850 metric tons) of all phosphorus entering the Great Lakes in 1976 came from the basin's agricultural land. Within agricultural watersheds studied in Ontario, 70 percent of total phosphorus came from cropland—in one watershed it was almost 98 percent.

About 60 percent of the total phosphorus was found to be associated with sediment. The main determinants are:

- How much clay is in the soil; and
- How much of the watershed is in row-crop use.

Soils with high clay content are high in phosphorus content, most susceptible to erosion, and most readily delivered to streams. Physiography, soil erodibility, drainage area, livestock population, and—to a lesser extent—fertilizer application also contribute.

In a given watershed, 80 to 90 percent of the sediment may be contributed by only 15 to 20 percent of the land area. This led PLUARG to the idea of "hydrologically active areas" to describe those parts of watersheds that need attention first and most.

Possible Solutions

Several practices can help control phosphorus losses from agricultural land as part of an overall management strategy to reduce phosphorus loadings from many sources. To be effective, practices must be carefully selected and adapted to the soils and other conditions at each site—there are no simple answers in water quality management.

Conservation tillage, for example, is effective in reducing phosphorus losses on a wide range of soil types. Yet on some soils subsurface drainage also is needed for effective conservation tillage. On some soils, and with some farmers, conservation tillage will not work!

PLUARG recommended that farmers within hydrologically active areas develop water quality management plans for their operating units, to insure that the practices *do* fit the site, *do* blend with each other, and *do not* price the farmer out of farming.

Practices that can reduce phosphorus losses from agricultural land are of three types: Those that:

1. **Reduce soil erosion:** Crop residue management, cropping sequences, seeding methods, tillage methods, soil treatments, and timing of field work. Contour farming also can reduce soil erosion, as Soil Conservation Service employees and conservation district cooperators are well aware. Yet these practices may not be effective where the slope is too long or the watershed area is too big, unless the conservation system also includes other practices.
2. **Control direct runoff:** Contour stripcropping, terracing, contour listing, sod-based rotations, conservation tillage, and others. Surface runoff from cropland rarely can be *eliminated*. It can be *controlled* by increasing water infiltration rates, surface retention or storage, or interception of rainfall by growing plants or residues.

3. **Manage or control fertilizer and animal wastes:** Limiting and timing fertilizer use; keeping livestock out of some areas near streams; and installing systems to collect, carry, and treat or apply livestock wastes.

All of these types of practices together can make a substantial contribution toward reducing phosphorus losses from cropland and pasture. In the 11 PLUARG study watersheds, the achievable reductions ranged from 36 to more than 50 percent.

Controlling soil erosion and sediment has other significant values besides reducing phosphorus: The soils in the Great Lakes Basin are among the most productive in North America. Keeping them in place and in good shape is important to the world's agriculture and to food and fiber producers. Keeping soil out of streams avoids serious effects on the physical aquatic environment, on fish populations, and on esthetics. Reservoirs will hold more water, bridges and stream channels can be maintained more effectively, and so on.

Benefits of reduced phosphorus loadings through erosion and sediment control are shared by millions of people within and outside the basin.

What about the costs? They vary just as the watersheds, the soils, and the effective practices do. In four PLUARG agricultural watersheds in Ontario, estimated costs range from $15 to $58 *annually* per hectare. In Black Creek, Ind., *initial applications* of the practices cost $146 per hectare. A significant part of the U.S. Lake Erie Basin may be treated at little or no long-term cost to farmers through the use of conservation tillage (although initial outlays for equipment may be an unwelcome cost).

The Strategy

PLUARG's recommendations lay out a strategy for control of *many* pollutants from *all* nonpoint sources. For phosphorus control from agricultural lands, the strategy includes:

- Development of plans;
- Implementation;
- Review and evaluation; and
- Public participation or consultation.

PLUARG said that management plans prepared by government units should include a timetable with program priorities; designate the implementing agencies; set formal arrangements for cooperation within and among agencies; tell what the programs are and how they will be funded; estimate the reductions in phosphorus loadings; estimate the costs to achieve them; and provide for public consultation and review.

PLUARG felt strongly about a role for the public as well as a strong emphasis on information, education, and technical assistance. Every one of the 17 public consultation panels that contributed to PLUARG suggested greater emphasis on information and education.

Their thoughts mirror those of the Great Plains Agricultural Council, which *in 1936* reported about the future of the Great Plains:

"No constructive conservation program can be developed without changing the motivating attitudes and habits and redirecting the efforts . . . of citizens generally in the region. . . . In a democracy, education is more fundamental even than legislation as a force directing rational progress. It is the basis of wise legislation, promotes general acceptance of legislative and administrative measures, and guides individuals to action along lines consistent with the requirements of the society of which they are members."

PLUARG also recommended that, in doing the planning:

- Existing mechanisms be used as much as possible;
- Present fiscal incentives be reviewed;
- Technical assistance programs be given more emphasis;
- Legislation be reviewed to make sure there is a suitable legal basis for enforcement where voluntary approaches prove ineffective, and
- Preventive aspects of laws and regulations be emphasized.

In the past, a keystone of soil and water conservation district programs has been that farmers *voluntarily* came to districts asking for assistance. This is changing somewhat. Pennsylvania and New York State laws now *require* conservation plans. In Ohio, farmers are assumed to be meeting State pollution abatement performance standards *if* they are following conservation plans approved by conservation districts. In Michigan, farmers are not required to have a permit for earth-disturbing activities *if* they are district cooperators.

Implementing the Strategy

PLUARG felt that regional priorities for action should be based on water quality conditions in each lake, the potential contributing areas identified, and the most hydrologically active areas within

them. PLUARG recommended that phosphorus loadings be reduced to achieve targets for individual lakes, and suggested some targets. Further reductions would be even better, in order to improve nearshore water quality and prevent degradation.

PLUARG recommended that erosion and sediment control programs be improved and expanded to reduce the movement of fine-grained soil particles to the lakes.

Agencies should help farmers develop and implement water quality plans for each farm in the most hydrologically active areas, PLUARG said. These plans should consider all potential nonpoint source problems—as well as the farmer's economic livelihood.

PLUARG further recommended that wetlands be preserved and that farmlands with the fewest limitations be retained for agricultural purposes. These suggestions are squarely in line with USDA's revised land use policy statement, Secretary's Memorandum 1827.

Voluntary *and* regulatory controls would be needed, PLUARG said, but regulation should be used only where or when voluntary approaches do not achieve desired results. In the PLUARG agricultural survey, 56 percent of the Canadian farmers and 71 percent of the U.S. farmers said the best policy for reducing water pollution was to rely solely on the voluntary cooperation of farmers.

Importantly, PLUARG felt that governments should maximize the use of existing programs before creating new ones. The Section 208 agencies within the basin, the U.S. Environmental Protection Agency (EPA), through its Great Lakes National Program office, and the Great Lakes Basin Commission have strong roles to play in the United States.

Soil and water conservation districts—190 of them in the U.S. Great Lakes Basin—have been actively involved in Section 208 water quality management planning as well as in aiding individual land users. Canada has a less well defined mechanism for onsite assistance, but there is excellent potential within the conservation authorities; Agriculture Canada; the Ontario Ministry of Agriculture and Food and other agencies in the Province of Ontario; and universities.

Review and Evaluation

PLUARG said that in any review and evaluation of the pollution-control strategies chosen, nonpoint source interests should be represented, along with a strong public consultation effort. It also recommended that:

- Tributary monitoring be expanded for more accurate stream loading estimates of several pollutants;
- Sampling be based on stream response characteristics, with intensive sampling of runoff events where needed;
- The role of atmospheric inputs be evaluated;
- Data be coordinated better; and
- Adequacy of nearshore and offshore water surveillance be examined.

PLUARG did *not* recommend a rigid scheme for achieving target loadings. Rather, each jurisdiction should compare alternatives for cost-effective and politically acceptable solutions, and make better use of existing agencies and programs. By working primarily through existing agencies, and by giving special attention to the cropland within the most hydrologically active areas—perhaps less than 25 percent of the basin's agricultural land—PLUARG felt that total phosphorus loadings could be reduced by more than 1,000 metric tons a year.

Many recent developments in both nations have been encouraging: Planning, workshops, research and extension, technical help, cost sharing, and grants. If they continue, phosphorus loadings to the Great Lakes *will be reduced.*

In Ontario, for example, workshops have been held with leaders of farm organizations. PLUARG recommendations are receiving very positive consideration from conservation authorities. A program to subsidize erosion control and manure management practices was scheduled to begin this spring. All of Ontario is eligible—but most of the expenditures and benefits will be in the Great Lakes Basin.

In the United States, the Rural Clean Water Program authorized by the Clean Water Act of 1977 could become an important implementing authority. This cost-sharing program, influenced to a large degree by PLUARG's findings, will apply only in critical contributing areas shown in EPA-approved Section 208 plans. Agricultural Conservation Program (ACP) cost-sharing assistance to farmers for conservation practices also helps reduce erosion and improve water quality. Special ACP projects recently announced will focus on water-quality improvement. State cost-sharing programs for certain practices also have been authorized by legislation in Minnesota, Wisconsin, and Ohio.

In both nations, agencies and organi-

Above, better methods for managing livestock wastes are already in place in many Great Lakes watersheds, helping reduce phosphorus pollution from basin farmlands. Left, conservation tillage and other practices can reduce phosphorus losses as much as 50 percent, by softening the impact of raindrops, controlling direct runoff, and reducing soil erosion.

zations have shown a great ability to adapt to changing needs and priorities.

A Good Start

Application of water-quality management practices already has begun in several watersheds within the basin, as part of special projects or as part of ongoing assistance programs. Waste management systems built on farms in the U.S. part of the basin last year alone are equivalent to the capacity needed to handle wastes produced by a city of 360,000 people.

Soil surveys have been completed on almost 90 percent of the cropland within potential contributing areas in the U.S. Great Lakes Basin. These are an essential tool in locating specific hydrologically active areas and in selecting practices. Every SCS office also has a technical guide and several field manuals, and Canada has similar working tools.

A Look at the Future

The principal planning and implementing mechanisms are in place to make agriculture's contribution toward meeting water quality goals. We have recommended a management strategy that is adaptable to physical, social, and political conditions throughout the Great Lakes Basin. What is needed is a commitment—on the part of Federal, Provincial, State, and local governments—to direct the needed technical, financial, and educational resources toward meeting the phosphorus goals described in Annex 3 of the 1978 Great Lakes Water Quality Agreement and hoped for by the public.

Will strategies for phosphorus control be meshed with overall strategies for achieving water quality in the Great Lakes? We do not want to unnecessarily polarize pollution abatement into single-pollutant pigeonholes. We will be most effective by taking a holistic view that permits taking advantage of "piggyback" benefits of programs as well as avoiding contradictory results from separate programs.

These things *can* happen; I think they *will*; yet I think we must resolve to move a little faster.

While awaiting IJC's final recommendations, some very positive efforts are underway, with grassroots public support and local leadership. None has resulted in any new agencies being formed!

At an April meeting, agricultural experts from Ohio, Indiana, Michigan, New York, Pennsylvania, and Ontario had a tremendous sharing of experience and knowledge, and open and frank discussion of successes *and* failures. They gave repeated challenges to get the best possible information to farmers in the best possible way; and pointed out great differences in areas, in soil type and its response or behavior, and in climatic conditions and patterns.

I am convinced that we need to use all of our tools in the tool box, in whatever mix is called for in specific situations. No one strategy, no one practice will do it all. No-till is great where it fits, but we should not "throw away the plow."

I am likewise convinced that water quality is more likely to improve if final land use and treatment decisions are made *in the field*. By far the best way to achieve an acceptable and effective program would be through one-on-one assistance to land users. With the small number of employees and volunteers available to do the job, however, we will have to augment the one-on-one with some other ways of sharing our knowledge with land users.

I am very optimistic about the future *if*, while we seek to expand our knowledge, we also will move quickly to help land users with what we already know.

In the United States, we have learned much through working with our Canadian friends in the PLUARG studies. These efforts will help our nations separately and jointly proceed with action programs to accomplish our goals for the Great Lakes.

Mr. Berg is associate administrator,
SCS, Washington, D.C.

New Measuring Flume for Farm Irrigators

Albert J. Clemmens, SEA research hydraulic engineer, places the "turtle" flume into an irrigation canal. The portable flume is useful in obtaining field information on water flow rates prior to installing a permanent concrete flume. Pressure sensing holes in the extendable pipe transmit water depth to the small gaging well located over the flume sill. The "turtle" flume is easily portable and weighs about 25 pounds.

A simple new measuring flume has been developed by USDA's Science and Education Administration (SEA) to help irrigators measure amounts of water applied to their fields.

The new flume, designed for concrete-lined ditches, is accurate to plus or minus 2 percent of the rate of discharge. Although it costs less than $100 to install, it operates with less head loss than more complex flumes that cost as much as $1,000. It was designed by John A. Replogle, a hydraulic engineer at SEA's Water Conservation Laboratory, Phoenix, Ariz.

To produce good crops, conserve water, and improve downstream water quality, farm irrigators cannot afford to "guesstimate" the amount of water flowing to their crops. They need accurate measuring flumes to manage their water efficiently.

In the past, however, calibrating flumes for accurate measurement was a time- and labor-consuming process that contributed to the high cost. The rate at which water runs through a ditch depends on many variables in the ditch such as slope, width, depth, roughness, and the amount of sediment.

Conventional flumes cannot be calibrated mathematically. Most are built in a laboratory and calibrated by running a predetermined amount of water through them, then duplicated for installation.

Replogle devised a computer program that takes all variables into consideration and figures the rate of discharge, eliminating the complicated laboratory calibration process. The program made the simplified flume possible. In fact, the computer can calibrate long-throated flumes of any shape, as long as they have one flat, smooth surface.

The new style flume consists of a broad-crested weir, a dam with a flat, smooth top or sill. The sill is from 1 to 4 feet long, and its height and width also can be varied to fit different ditch sizes and flow rates. The dam causes a rise in the water upstream to create critical flow over the sill and allow accurate measurement.

A short ramp guides the water over the sill evenly. It also guides sediment and debris over the sill to keep the canal free of clogs. Small pipes, imbedded through the bottom of the ramp and dam, drain the ditch when not in use to eliminate stagnant water and to help control mosquitoes.

A gage is placed on the side of the ditch about a foot upstream from the end of the ramp to measure the critical flow. It is marked to read out in direct discharge units, such as gallons per minute or cubic feet per second, so the irrigators do not need calibration tables to figure the amount of water passing through to their fields.

Irrigators can easily install the simplified flumes with specifications and technical assistance from the Soil Conservation Service. SCS's National Engineering Bulletin No. 40–9–8 contains drawings, design tables, and design calculations for a typical broad-crested weir.

The only materials needed to build a flume are plywood and wire for forms, a few lengths of plastic pipe, concrete, and a gage. Flumes can be built with poured-in-place concrete or with hollow precast concrete.

A portable sheet metal flume also has been developed. Called the "turtle" because of its shape, the portable flume is especially useful to SCS engineers and soil conservationists, according to Ralph Arrington, SCS conservation engineer for Arizona.

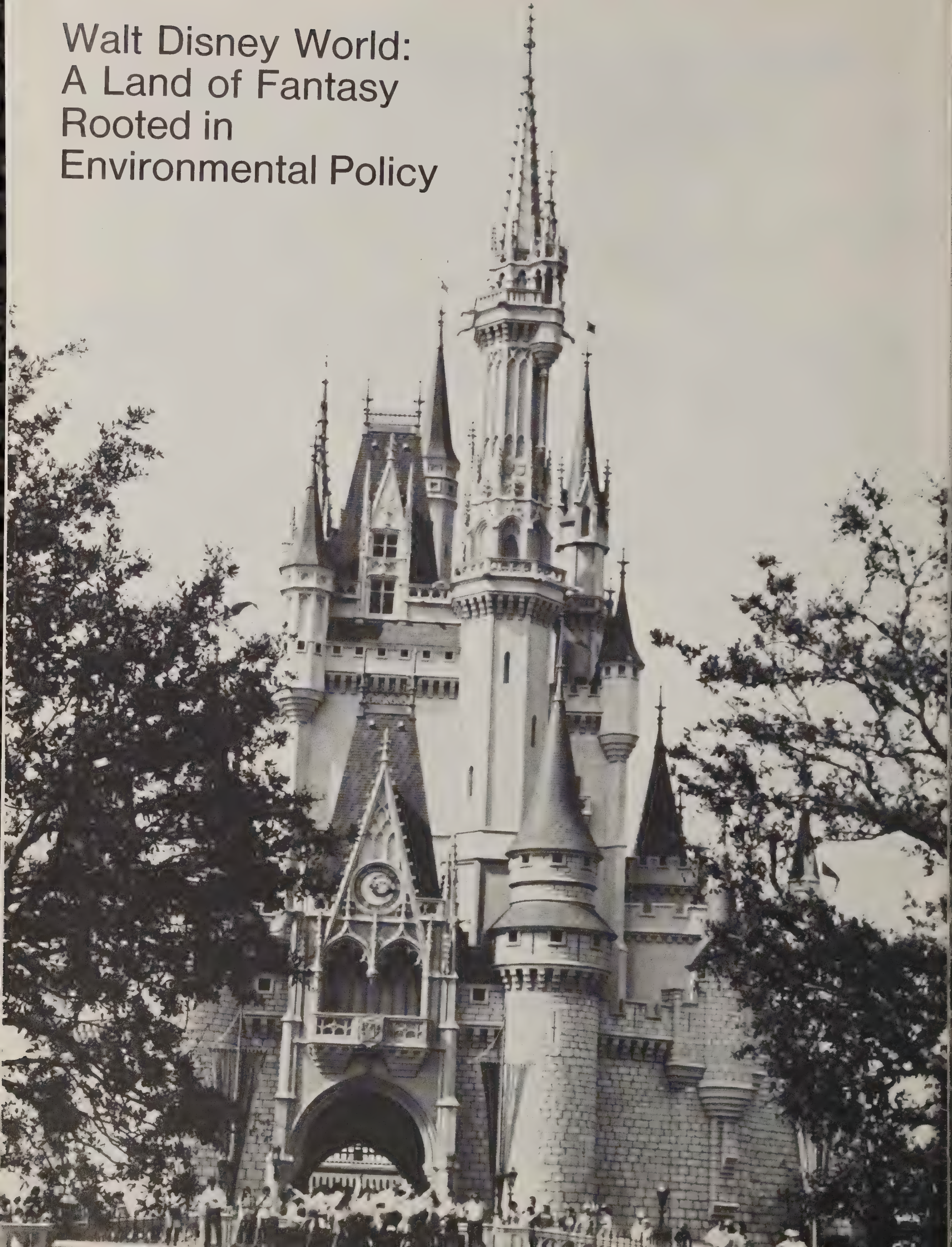
"We can use the turtle temporarily in irrigation ditches that have no permanent flume to meter the flow and help an irrigator determine his management efficiency. The turtle also helps us 'sell' the irrigator the idea of installing a permanent flume because it is accurate and easy to read and he can see how useful the flow rate information is for his particular farm," Arrington said.

The turtle also helps irrigators determine the proper size and placement for permanent flumes.

For the computer program that led to simplified flumes, the American Society of Civil Engineers awarded Replogle the Croes Medal, one of its highest honors.

Adapted from an article in the March 1979 issue of *Agricultural Research*.

Walt Disney World: A Land of Fantasy Rooted in Environmental Policy



Florida development proves that a good environment is good business.

by Anne Schuhart

Walt Disney was an environmentalist long before the word became popular. That ideology was epitomized through his wildlife documentaries and animated features.

But can a large corporation maintain idealistic environmental standards and still show a profit? Walt Disney World near Orlando, Fla., does.

"At Disney World, development of an esthetic environment is a way of life, and Disney has proved that it's money in the bank because it's a major factor in bringing people back. The esthetic quality of the park contributes to bringing guests back for their second, third, and fourth times," explained Tom Moses, head of the Reedy Creek Improvement District, a special tax district encompassing Walt Disney World.

Walt Disney World covers 27,500 acres, two-thirds of which lie in Orange County and the remainder in Osceola County. It attracts more than 14 million visitors annually. The services necessary to accommodate such a development would be a drain on the budgets of both counties; consequently, the Florida legislature created the Reedy Creek Improvement District to provide those services necessary for the construction and operation of Walt Disney World.

"The district has essentially the governmental controls exercised by counties, except for police power," said Moses. "We provide such services as fire protection, wastewater treatment, building codes, and environmental protection. The company, Walt Disney Productions, Inc., pays what amounts to an additional layer of taxes: regular taxes to the two counties, plus those essential taxes for the operation of the district.

"Preserving an esthetic environment was a major thrust of the development from the beginning—from the first rough sketches in California," Moses recalled.

"The company strategically located facilities so that a minimum number of trees and shrubs had to be disturbed. The district has over $8 million invested in the original stormwater control system alone, and that will be expanded as development continues. Even in the center of the main parking lot, the company preserved an 11-acre cypress dome because of its beauty.

"It's significant that when we began in 1968, the district set out the environmental parameters. At that time there were few environmental laws, and no permits were required from State agencies. In the initial phase, for example, Walt set aside 7,500 acres for a conservation area long before he had defined the locations and extent of the development."

To discourage concentrations of development close to the Disney Magic Kingdom, the theme park is located in the remote northwestern corner of the district. Access by the public is provided by a road from Interstate 4 and Florida Highway 192 northward through the middle of the property.

Disney has developed three golf courses, hotels, resort accommodations, a shopping area, office buildings and service areas, a 600-acre camp-

At Walt Disney World, environmental protection and esthetics are part of every phase of development. Even the banks of sewage lagoons are smoothly curved and well vegetated.

ground, and three lakes and lagoons north of Interstate 4. A 1,500-acre block of pasture and range, which is leased for cattle grazing, and a major portion of the 7,500-acre conservation area are south of the highway.

One of the first steps in developing Walt Disney World was the construction of 40 miles of canals and levees around the perimeter of the property with other canals interconnecting where development dictated. The canals are equipped with self-regulating water control structures, which enable the district to maintain normal levels during periods of drought and to safely discharge floodwaters after excessive storms.

The water table must be kept at a delicate balance—low enough so that the land can be used but high enough to maintain vegetation. "We use infrared aerial photographs, taken annually of the entire property, to check for stress in the vegetation," Moses said.

In keeping with the emphasis on esthetics, the entire canal system is well vegetated and immaculately maintained. It also is designed so that all canals are curvilinear and thus more

Above, a main canal was constructed around the Disney property, including the 7,500-acre conservation area. This native swamp provides shelter for wildlife, including alligators, wood storks, ospreys, sandhill cranes, and woodpeckers. At left, the canals are equipped with self-regulating water control structures enabling the district to maintain a constant water level.

appealing to the eye than the straight drainage ditches used in most places. It is not uncommon for guests to see deer and other wildlife on the grassy banks and levees.

Nonpoint source water pollution is a key target of the Reedy Creek Improvement District.

"Our guests, and the company, want to see clean water and a clean environment. That's part of our reputation and part of the show," said Fred Harden, manager of the company's Environmental Relations Department. The district employs a total of 13 biologists, chemists, botanists, and lab assistants to maintain that reputation.

The main parking lot, which can accommodate 12,000 cars, is also divided by drainage canals. Grass swales along the canals filter runoff and provide greenery. In addition, all trash is vacuumed from the parking lot every night to make sure that none washes into the canals.

Near areas under construction, "turbidity curtains" are placed in waterways to prevent spread of sediment. The sediment is chemically treated so that it settles quickly to the bottom.

"The Reedy Creek Improvement District Pollution Control Department runs 30,000 analyses a year to monitor the quality of the water as it enters and leaves the property. We make sure that it contains no effluent from the waste treatment plant or pollution from the theme park. We now have background data on the water quality here for at least 5 years," said Pat Harden, a biologist with the district pollution control department.

"In fact, Disney is one of the few developers that started out with raw land and clean air and kept records on how the construction and operation affected the environment from the day the first bulldozer moved in," added Moses.

"Our lab is one of the best equipped in the State for testing water quality," Pat Harden said. It includes an atomic absorption unit with an electro-thermal atomizer which measures parts per billion of heavy metals (parts per trillion in some cases). It also has a gas chromatograph to analyze pesticides.

"There are citrus growers around the property, and they use chemicals. We also use certain approved pesticides," she explained.

"If the water in Reedy Creek becomes polluted," she continued, "Disney will get the blame whether they contributed to the problem or not simply because they are such a big and visible operation."

"That is one reason why we have tighter codes and regulations than other government entities," said Moses. "We also cooperate with Orange and Osceola Counties in an effort to control cleanliness of the water in our watershed.

"We're not opposed to periphery development in the counties so long as it doesn't degrade the environment, especially the quality of the water that drains into our property."

Because of the number of tourists, the area is growing rapidly. However, some of the nearby land is not suitable for development.

"For example, there are 1,500 acres of undeveloped land directly north of the theme park, and the drainage would have to come through Walt Disney World," said Richard Hoffman, Soil

A "turbidity curtain" across a canal along the main parking lot catches sediment downstream from a construction site.

Conservation Service district conservationist at Orlando.

"The owner divided the land into 5- to 140-acre blocks and advertised it for sale as 'prime development land next to Disney.' Only about 20 percent of the land has potential for development, and the whole tract is a long way from the entrance gate to Disney World," he said.

"Orange County asked SCS to do a soils report. The report shows that almost all the land is swamp and floods every summer, and much of the area is covered with 5 to 10 feet of muck. The county stopped the auction until the advertising reflected the true conditions."

SCS has provided technical assistance to Disney World since the Reedy Creek Improvement District became a cooperator with the Orange County Soil and Water Conservation District in 1973.

"Our relationship with SCS is a good one," said Fred Harden. "It began when Fred Merrill was district conservationist, and he started interpreting soil surveys and helping us develop our conservation plan. The soils information has proved correct and we have relied on it over the years."

The information is used in the planning of all future projects at Walt Disney World.

SCS used the soils data as a basis for evaluating sites for land treatment of 3 million gallons of secondary treated sewage effluent a day. According to the permeability and available water capacity of the soils, the depth of the root zone, and the water use rate of grass, SCS determined the amount of partly treated effluent that could be applied safely to the land at a time, the acreage needed for treatment each day, the number of days needed between applications on each plot for proper cycling, and the total acreage required.

"We've planted close to 1,000 acres of slash pines, and we've planted sand pines where the survey shows the soils

Standing in front of the soils map, District Conservationist Richard Hoffman (right) discusses use of the soils information with Fred and Pat Harden.

are suitable. We've had good results with both," said Pat Harden. "We've also planted test plots of eucalyptus according to the survey to check their growth rates on different soils."

Looking ahead, the Reedy Creek Improvement District contracted with the U.S. Geological Survey to construct control wells in the conservation area. The wells are monitored to provide background data on the ground water as a basis for future comparisons. The soil survey was used to place wells in representative soils.

SCS also has helped solve a number of other problems, including controlling shoreline erosion around the lakes and stabilizing critically eroding areas.

"Environmental services constitute about 30 percent of the district's budget," said Moses. "We spend about $2 million a year on the water management system and pollution control. Just the maintenance on the water control system approaches $300,000 a year, and we spend approximately the same amount on the lab operations monitoring water quality.

"We go beyond the minimum," he continued, "because the district and the company believe it is the best investment we can make. Preserving the environment not only serves the best interest of the public, but it also helps attract people to Walt Disney World.

"That is not to say that economics are not a concern, but our priorities are significantly different from those of other developers and governmental entities." That's what makes the Reedy Creek Improvement District unique.

Ms. Schuhart is a writer-editor, Information Division, SCS, Washington, D.C.

Shoreline erosion is controlled with grass in most places and riprap in a few critical spots.

The Soil and Water Resources Conservation Act (RCA)

Where We've Been

RCA requires USDA conservation programs to be responsive to the long-term needs of the Nation. The act calls for an appraisal of the Nation's non-Federal land and water resources. It also mandates public participation in the appraisal and in developing a national program for conserving these resources. As part of the Public Participation Program, nearly 9,000 locally organized RCA meetings were held in 1978. Results of the meetings indicate that America's citizens are definitely concerned about the future of the Nation's natural resources.

More than 164,000 people participated in the public meetings which outlined the RCA process, obtained the public's views regarding soil and water conservation, and identified possible solutions to resource problems.

The meetings were conducted with the assistance of local soil and water conservation districts and were generally held in individual counties. Multiple meetings were held in many densely populated counties.

Worksheets outlining the major resource topics discussed at each meeting were completed by the local Soil Conservation Service district conservationist based on conclusions reached at each local meeting.

The following numerical ranking shows the number of meetings where the particular issue was brought forth and discussed as a major natural resource concern. The figures do not represent a ranking "of importance" by the reporting offices. Air quality and wetlands, for example, each appeared on about 300 worksheets. This indicates that these issues are considered major local environmental issues by one out of every 10 counties.

A composite of the 3,485 worksheets indicates the following distribution of major natural resource or environmental concerns:

Resource Concern	Number of Responses
Soil erosion	2,994
Food and fiber production	2,443
Land use	2,163
Water supply	2,042
Water quality	1,606
Socio-political	1,438
Flooding	1,262
Irrigation	1,244
Rural development	1,234
Prime, unique, and important farmland	1,202
Drainage	1,042
Recreation	1,031
Forestry	1,027
Wildlife habitat	933
Land disposal of organic waste	931
Fish habitat	568
Other	537
Mining	452
Environmental	430
Wetlands	303
Air quality	300

As expected, the public's major resource concerns were those encountered in their local area or State. For instance, irrigation ranked as a major concern in western States, Georgia, and Florida, but received a low priority in other parts of the Nation. This would reflect the role irrigation plays in local agricultural activities. In contrast, land use was indicated as a major concern all across the Nation, resulting in its appearing on a greater number of meeting reports than irrigation.

The expressed concerns are being compared with the National Resource Inventories factual data which will be included in the Appraisal Report.

Public participation in the RCA process is designed to obtain the thoughts of local citizens about local natural resource and environmental problems. The results of the first series of meetings have provided clear indications of the Nation's major environmental concerns as expressed by more than 164,000 citizens.

Where We're Headed

Detailed planning is now progressing on the 1979 Public Participation Program. After publication and distribution of the draft appraisal, program, and policy documents in early fall, a 60-day public review will be held. During this time, comments about document contents will be accepted by USDA. Full details of where the documents will be located for review, exact review period dates, public meeting dates and locations, and how the public comments are to be used will be published in the Federal Register at the start of the public review period.

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Memorandum Expands SCS Assistance to FmHA Borrowers

A memorandum of understanding signed in May by the administrators of USDA's Farmers Home Administration (FmHA) and Soil Conservation Service (SCS) will make available to FmHA and its borrowers additional information from SCS on soil, water, land use, and environmental questions and problems.

Signed by R. M. Davis of SCS and FmHA's Gordon Cavanaugh, the understanding will make it easier for SCS to provide practical technical information to FmHA borrowers under the agency's four credit categories: farm, rural housing, community programs, and business and industry.

The memorandum spells out a working understanding between the two agencies aimed at making SCS technical expertise available, when needed, for:

- Conservation planning on FmHA borrowers' farms;
- Planning community-type water supply and waste (including solid waste) disposal facilities financed by FmHA;
- Environmental assessments and impact statements related to projects financed by FmHA;
- Identifying erosion hazards and soil limitations, if any, for areas under consideration as FmHA financed building sites.

FmHA, the farm and rural development credit arm of USDA, provides financial and technical assistance to rural and smalltown families and communities handicapped by inadequate resources.

Both FmHA and SCS have local programs in nearly every county of the United States.

The memorandum signed by the two agriculture department agencies replaces an outmoded understanding between them. The memo also supports the department's land use policy as spelled out by Secretary of Agriculture Bob Bergland.

Meetings:

July	
10	No-Tillage Systems Conference, Lexington, Ky.
14–28	National Association of Counties, Kansas City, Mo.
19–21	Izaak Walton League of America, Inc., Anaheim, Calif.
22–26	National Federation of Business and Professional Women's Clubs, Inc., Boston, Mass.
28–Aug. 1	American Association of Nurserymen and Southern Nurserymen's Association Convention and Horticultural Trade Show, Atlanta, Ga.
29–Aug. 1	American Agricultural Economics Association, Pullman, Wash.
29–Aug. 1	Land Application of Waste Materials Conference, Ottawa, Ontario, Canada
29–Aug. 1	Soil Conservation Society of America, Ottawa, Ontario, Canada
August	
5–8	National Farm & Power Equipment Dealers Association, Detroit, Mich.
5–10	Joint Meeting of the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America, Fort Collins, Colo.
12–16	Conservation Education Association, Dingmans Ferry, Pa.
19–22	American Institute of Chemical Engineers, Boston, Mass.
September	
5–7	American Water Works Association, Chesapeake Section, Ocean City, Md.
9–12	International Association of Fish and Wildlife Agencies, West Yellowstone, Mont.
12–14	American Fisheries Society, West Yellowstone, Mont.
22–26	American Society of Landscape Architects, New Orleans, La.
24–28	Federal Bar Association, San Antonio, Tex.
25–28	National Conference of Editorial Writers, Phoenix, Ariz.
26–30	The American Horticultural Society, Palm Beach, Fla.
30–Oct. 3	Farm and Industrial Equipment Institute, San Francisco, Calif.
30–Oct. 4	National Association County Agricultural Agents, Rapid City, S. Dak.

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